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APRIL
1951

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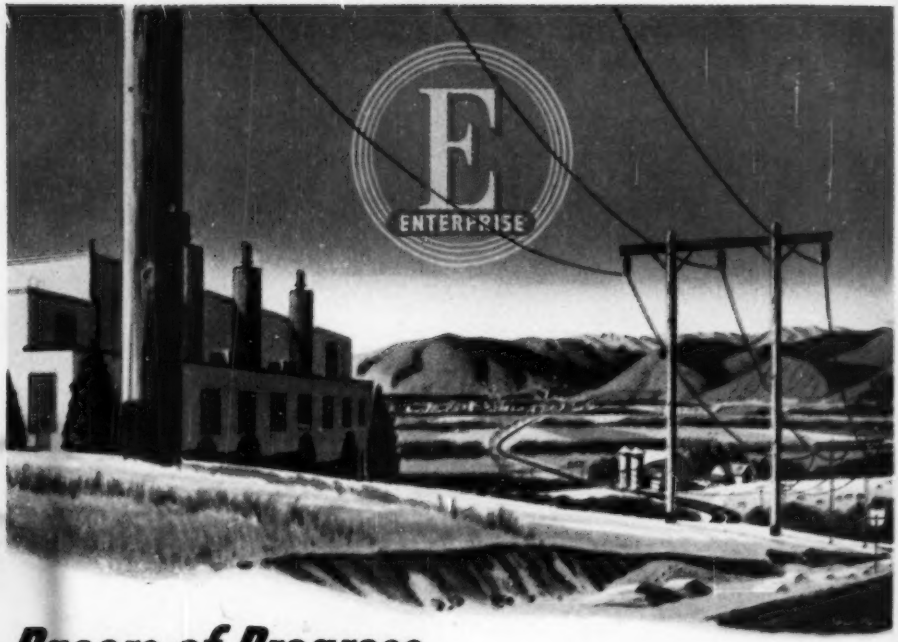
General Motors Overseas—p 19



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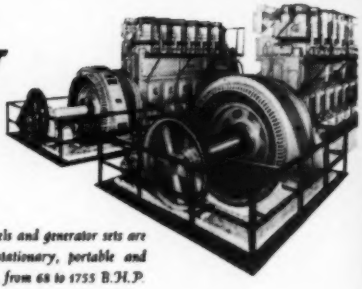

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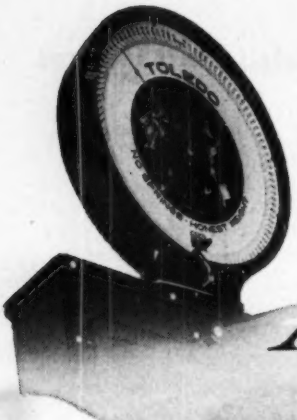

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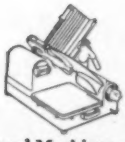

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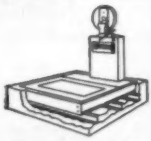

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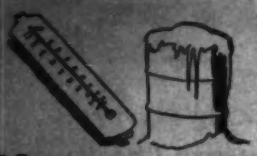

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Business Trends

UNITED STATES is heading into a new kind of mobilization—designed for long-run preparedness. Washington, expecting the emergency to last for 10 years or more, is planning accordingly.

This is a limited mobilization, in terms of both manpower and military production. The size of U. S. armed forces will reach only 4-million to 5-million men, and actual production of weapons will be far below the requirements for full-scale warfare.

Plans call for equipping U. S. armed forces with modern weapons, building reserves of weapons sufficient for 1 year of war, and providing allies with key military items they cannot make themselves. At its height, the program will take 20-25% of total U. S. production, compared to about 45% at the peak of World War II.

Real emphasis is on expansion of industrial capacity. Goal is twofold: sufficient capacity for production of both military items and a heavy flow of civilian goods, and big stand-by capacity for military production in case of war. This means a heavy drain on the U. S. economy—much larger than the amount of military production alone indicates.

Strain will be greatest in 1951 and 1952, and taper off after that. Steel expansion—14-million tons or more in 2 years—will be almost over by the end of 1952. Aluminum production is expected to go to 800,000 tons in 1951. In 1952, the rate of production should reach 1,100,000 tons a year. Capacity in most other basic industries cannot grow so fast as in the steel and aluminum industries, but they too are expanding.

Strain will ease off by 1953. Expansion will be about completed. If there is no war, U. S. may be able to drop most controls, go back to producing for domestic and export consumers at pre-Korea levels, and still maintain the defense program at the same time. By 1954, civilian production should be able to top even the record 1950 levels.

U. S. INDUSTRIAL PRODUCTION is up 10% since Korea. By fall it may rise another 10%, past the record World War II peak. By 1952, production should be 30% above present levels.

Durables show the biggest increase—14% since Korea. And production is still far below World War II levels, even though capacity is now about one-fourth greater. Output of durables will move up fast later this year, but most new production will go to the military. Civilians will get less of nearly everything made of metal.

U. S. is expanding output of basic metals to meet new needs. But supplies cannot keep up with the demand—and will not for a year or two at least. As a

Business Trends (Continued)

result, demand for imported metals will rise to new heights as military production grows.

Steel expansion will ease the shortage, but not this year or perhaps even next. U. S. would like to import 1-million tons or more in 1951.

Aluminum supply problems should be easier by the middle of 1952, when most expansion programs will be completed.

Copper is a key metal for defense production. Output of refined copper last year was 20% greater than in 1949—and still far below demand. Stocks are down to about 40% of those of a year ago, and production cannot be increased very fast.

Zinc output is rising, but a shortage threatens.

Lead is still in good supply, even though 1950 consumption sets a record. But lead may get tighter as it substitutes more for scarcer metals.

Magnesium output is way up, can go much higher—from the present 48-million pounds a year to 240-million pounds if standby plants are used.

Titanium shows phenomenal growth in output. Production, 120,000 pounds last year, may reach a rate of 6-million pounds by midyear. But demand will probably grow even faster.

Other basic industrial materials, such as chemicals, show the same pattern —larger production, but an even greater increase in demand. Result is a continuous, growing squeeze on supplies for civilian production.

Output of automobiles and trucks will fall throughout the year. Cutbacks are expected to range between 20-35% in the first half, more later on. Auto parts may be cut 35-40% by midyear.

Production of large appliances will be off at least 25%, small appliances 20%. Television sets will be harder hit; cutbacks may reach 50% by midyear.

These cutbacks are not caused by the military program alone. Expansion of industry makes them much worse in the short run by taking steel, other metals, and manpower away from civilian production. But, in the long run, expansion of industry will mean a quicker return to producing for civilians.

U. S. FARMERS plan to grow bigger crops this year. In 1950, the U. S. Dept. of Agriculture wanted smaller plantings to keep prices up. So supplies are much smaller than they might have been. Now increased acreage is planned for basic crops to ensure future supplies for domestic use and export. Cotton acreage—18.5-million in 1950—will be around 28.4-million in 1951. Spring wheat—18.5-million acres last year—will be 21.4-million this year. Corn acreage will go from 84.4-million to about 90-million.

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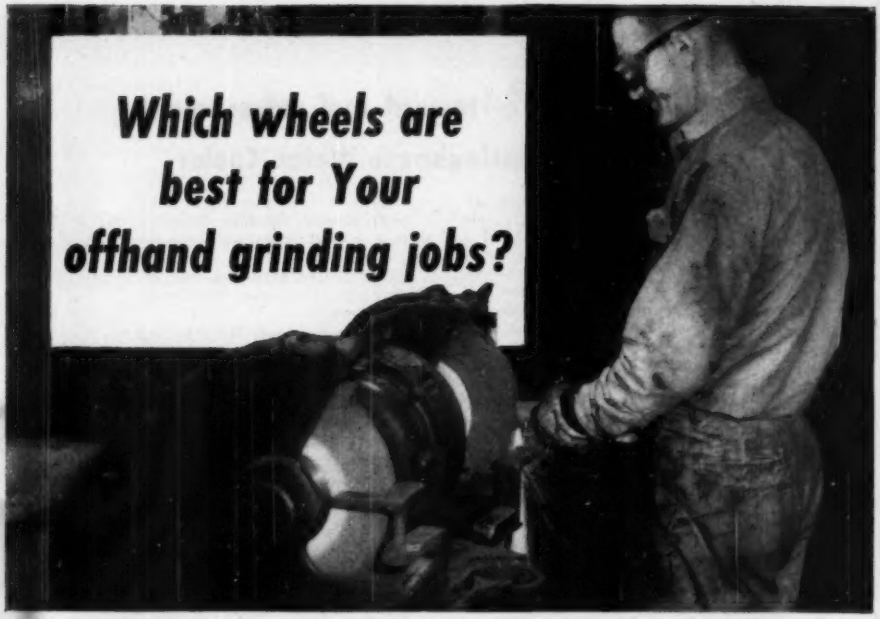

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Washington Report

VICTORY WITHOUT WAR is now the talk in Washington, where once again confidence is building up. The nerve-shattering crises of last fall have given way to a calmer period. Officials are talking guardedly of "negotiated" settlements in Germany and Korea.

Public talk is still prepare for war. The administration is still more scared of being unprepared than of doing too much. And "appeasement" talk is much less popular in the U. S. than what Europeans call "provocation." No U. S. official or politican would dare understate the Russian threat. Most will overstate it to be on the safe side. And all remember that Red aggression has a habit of starting in spring or early summer. But even so, official thinking is more moderate than it was 6 months ago.

Yugoslavia is the big question mark. All the ingredients of a Korea-type war are there. Tito faces real internal troubles unless he gets more economic help. But Washington is more afraid about what might happen than about what is happening. The U. S. is pulling together another big economic-aid program for Tito. Much of the scare talk coming out of Washington is designed to pave the way in Congress for this program.

Is Stalin ready to negotiate on Western terms? Not many officials think so yet. But planners are thinking beyond the point of building up strength. The Big Four diplomatic showdown now in progress may show the West that Russia will never compromise. But Washington is not ruling out the possibility that Western policy may be succeeding.

INFLATION PROBLEM is now more serious for Washington planners than defense. Prices here and in Western Europe have already risen sharply, even before the expected shortages have materialized.

Continental Europe has worse inflation than the U. S. Wholesale prices in France and Italy are up 20% since Korea and are rising fast. U. S. wholesale prices are up about 18% and are rising, but not so fast.

Officials are worried that inflation may affect much of Western Europe's military production potential. European countries have been trying to control prices by increasing the supply of goods. In France and Italy, this has gone to the extreme of diverting exports to the home market. Conversion to arms production will mean still lower exports and lower consumption levels.

More U. S. economic aid in the form of food, textiles, and raw materials looks like the only answer. Washington would like to limit aid to arms and direct contributions to military production. This aid would be enough if Western Europe could concentrate on exporting to pay its way in the world. But Western Europe's arms deficit is so great that the U. S. could not possibly fill the gap

Washington Report (Continued)

and meet its own needs too. As it is, Western Europe naturally comes off second best in the distribution of available arms production from the U. S.

DEVELOPMENT LOANS from the World Bank and the Export-Import Bank will have to contribute to Western defense from now on. Both banks are captives of the supply situation. Strategic-materials development and power and transportation projects connected with strategic materials will get most favorable attention.

A good example of a likely development loan these days was World Bank's $50-million credit to South Africa last winter. The money went for power and transportation equipment in the gold mining areas of Orange Free State and West Rand. What persuaded the bank's U. S. governor to vote for the loan was the prospect of a big uranium supply from the same gold mines.

World Bank hopes to avoid its dependence on defense planning by making more loans in non-dollar currencies—mainly sterling, Swiss francs, and Canadian dollars. Bank officials expect to procure some equipment more easily and cheaper in Europe in the coming months than in the U. S.

DIRECT TAX INCENTIVES, businessmen have persuaded the government, are the only means to get private capital moving abroad in any volume. The reason: the U. S. has enough good investment outlets at home.

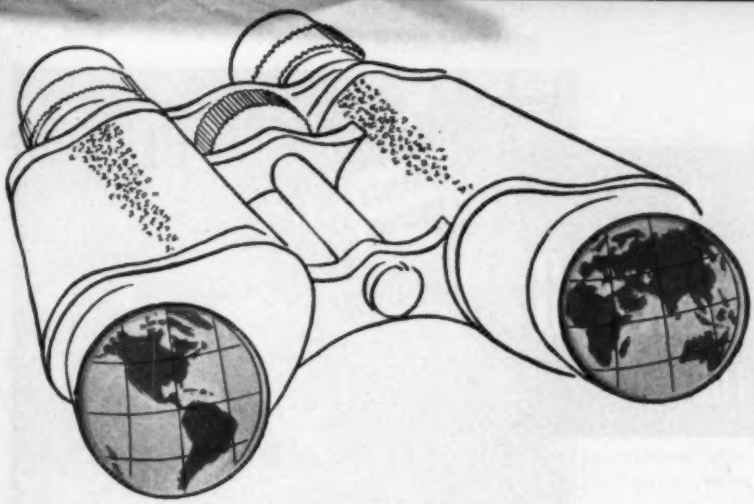
The government hopes that private investors will do a lot of necessary strategic-materials development work in South America and Africa in the coming years. But chances of getting Congress to rewrite tax laws are poor.

Private capital moved out of the U. S. at an average of $1-billion a year between 1946 and 1949. Almost 80% of that went to oil projects in Canada, Latin America, and the Middle East. But capital outflow dropped in 1950.

WORLD ALLOCATION of basic manufactures, including steel, tinplate, and newsprint has been suggested to the State Department by several nations. Raw-material producers think this should be the price industrial nations should pay for raw-materials allocations (McG-H Digest, Mar, p15).

The new International Materials Conference, now functioning in Washington, could do the job. But State Department thinks it impractical. Committees probably will be set up to study these items, allocations are unlikely.

IMC groups are now studying copper, lead, and zinc; sulfur, cotton and cotton linters; tungsten and molybdenum; manganese, nickel, and cobalt; and wool. These items need allocations as soon as they can be worked out. Quick action is most unlikely. Producing nations are holding out for more assurance, particularly from the U. S., that their essential needs for manufactures will be met. Washington has not yet solved this problem.



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A Clark Utilitruc pictured above at the Port of Auckland, efficiently serves as a mobile scaffold that enables maintenance men to reach a remote part of a giant travelling crane. It is astonishing how many extra jobs can be done easily, safely and quickly by means of these sturdy machines.

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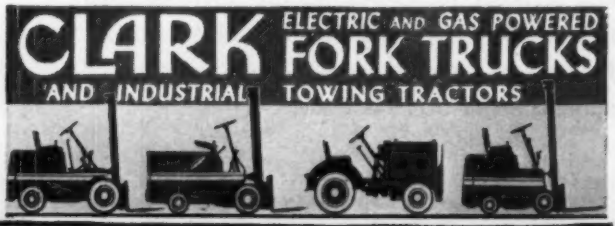

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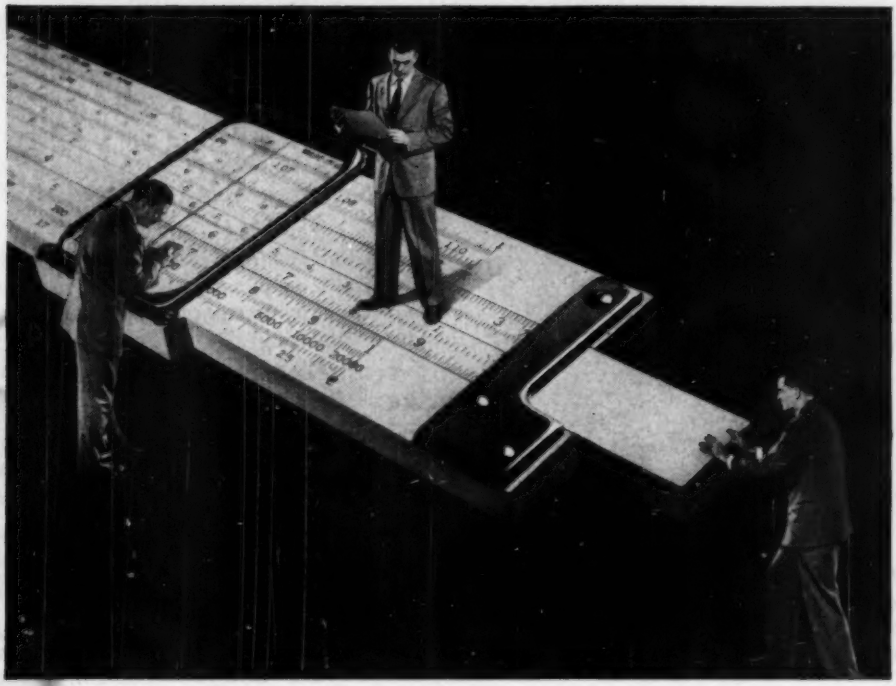

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THE HOLDEN AUTOMOBILE—Australian built to fit Australian needs—is only one of General Motor's contributions to the economy of that country and is a substantial example of . . .

How G. M. Operates Overseas

General Motors has a philosophy for doing business abroad that has gained it a reputation of advanced thinking in international trade

AN "INTERNATIONAL COLOSSUS", the "world's greatest industrial empire"—General Motors Corp. has been called many such things, likened even to the pyramids of Egypt. But its story can never be told in terms of size alone because size is just one of the results of the company's consistent policy of offering to the public the products it wants and at a price it can afford and is willing to pay.

The largest and most profitable manufacturing company in all of history—in size, that is General Motors. In 1950 it made more automobiles than any company ever before made in one year—nearly half of the 6,665,000 automobiles built in America.

And it made 650,000 trucks, 2,250 buses, over 2,000 diesel-electric locomotives, and millions of other products—refrigerators, ranges, ironers, washing machines, food freezers, water heaters, oil burners, air conditioners, aircraft propellers, jet engines, diesel engines, tank transmissions.

Yes, General Motors is big. It employed more than 450,000 American workers last year. And it had a net income last year of over $834-million—again more than any company ever made in one year. But to understand General Motors, one must look beyond its size and understand its philosophy of business management. And nowhere in all its divisions is this more evident than in its foreign operations.

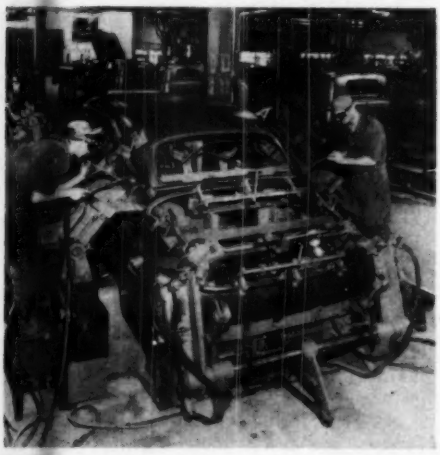
The Overseas Operations Division of General Motors in itself is no small

enterprise. For many years it has been more than an export sales organization. Since 1924, when plants for the assembly of Chevrolet automobiles were established in Copenhagen and Hendon (near London), G. M. Overseas has grown into a world-wide network of manufacturing plants, assembly plants, and branches employing about 65,000 people in some 25 countries.

Of these 65,000 employees, less than 2% are American. Of the other 98%, practically all are nationals of the countries where they work.

After its first step into overseas assembly, G. M. forged ahead rapidly. The next few years saw assembly lines turning out automobiles and trucks in Argentina, Australia, Belgium, Brazil, France, Germany, India, Japan, Java, Mexico, New Zealand, Peru, South Africa, Sweden, Switzerland, Uruguay, and Venezuela.

The results gained by assembly abroad well justified the investment cost. As each plant swung into full operation in a transportation-starved world, it began paying a handsome return. Shipping costs were reduced, and import duties were lower on the unassembled automobiles and trucks. Knocked-down vehicles took much less ship space.



***AUTOMOBILE ASSEMBLY** in G. M. many plants around the world is more than putting nuts and bolts together. This welding job, in Sao Paulo plant of General Motors do Brasil S. A., shows that a primary function is training of workers.*

G. M. Begins Local Manufacture

Soon another far-reaching step was taken—one that to this day has contributed to the industrial economies of those countries where G. M. Overseas operates. This step was to arrange for local manufacture of some parts that went into the assembled automobiles. An example was automobile and truck bodies from Holden's Motor Body Builders in Australia. (This was the same Holden's that later became part of G. M.).

Local manufacture of components proved to be a valuable, cost-cutting aid. Trim and upholstery could be bought more cheaply in local foreign markets than they could be made in America and shipped overseas. Then came glass, tires, batteries, springs, spark plugs, and other parts. The extent to which local manufacture was carried depended on the local conditions of industrial development.

G. M. Buys Vauxhall, Opel

Expansion abroad was made not only by establishing assembly plants, but also by direct purchase into going concerns. In 1926, G. M. bought Vauxhall Motors in England. This provided G. M. an alternate source of supply to protect investment in assembly plants if anything happened to affect the flow of materials from the U. S. It also enabled G. M. to compete in foreign markets and to meet the growing demand for smaller, lower-powered automobiles that high horsepower taxes and high fuel costs made popular.

Later, in 1930, G. M. bought the German firm of Adam Opel A. G. to become even more firmly established in the low-powered field, both in the European and export markets. The Opel soon

was considered the most important automobile on the German market and an outstanding competitor in the world's market.

That in brief was G. M. Overseas' history. It made and bought and sold. It used the tin and rubber that came from Malaya, zinc and lead from Peru, copper from Chile, manganese, chromium, and copper from Africa, wool from Argentina, New Zealand, and Australia, shellac from India, kapok and wax from the East Indies, cork from Portugal and Algeria, zinc oxide from Belgium, ocher from France, and countless other materials from other parts of the world and turned them into finished automobiles.

Quality, Variety, Price

It adapted its policies to local economic conditions. It expanded its distribution system to complement its manufacturing activities. It made its products available to the world in quality, in variety, and at a price that made them sell—and that are still making them sell.

But not all the time was the sailing clear. The depression of the '30's followed by the war of the '40's was weathered, but with some losses. The Opel plants were damaged during the war, but postwar reconstruction is bringing Opel's production at Russelsheim back to its prewar level. Last year, Opel turned out over 72,000 vehicles and expects to manufacture 95,000 this year if the raw materials are available to make them.

In Germany, Opel is contributing to the government's export drive to get foreign exchange, just as in England Vauxhall is doing the same. Vauxhall, in accordance with the English government's quota requirements, exports about 75% of its passenger cars and 60% of its trucks. About 40.5% of Opel's production is going into export. This is well above the export proportion of 28% in the best prewar production year of 1939. Leading markets are Europe, including Belgium, Holland, Switzerland, and Scandinavia, as well as South Africa and South America.

***REFRIGERATOR ASSEMBLY** at Frigidaire's plant in London includes the assembly of condensing units by modern methods and with up-to-date tooling and materials-handling equipment.*

For other G. M. Overseas plants during the war, the story was one of vast achievement. In Australia, New Zealand, South Africa, England, Brazil, India—G. M. plants were all converted to war production.

General Motors-Holden's in Australia turned its six plants to the manufacture of airplane engines and cannon, shells and torpedoes, towboats and barges, trucks and armored cars, and many more of the peculiar fare of war. In England, Vauxhall Motors at Luton, Delco-Remy-Hyatt and Frigidaire at London, and AC Spark Plug at Dunstable played no small

***FRONT COVER**—This native of India is cleaning up the tapered ends of cross bearers on a double-headed vertical spindle shaper at General Motors' Bombay plant.*

part in rearming Britain after Dunkirk.

In Brazil, the G. M. plant supplied 98% of the motorized transport for the Brazilian army. In India, the Bombay plant of G. M. India, Ltd., expanded again and again to meet its share of the war work needed and, at the end of the war, had a productive capacity of six times its previous production of trucks.

Plants in Neutral Countries

Not all G. M. Overseas plants were in the fortunate position of being able to aid the Allied war effort. In Sweden and in Switzerland, the G. M. plants faced years of disruption of their normal business and the hard lot of the completely surrounded neutral. What was done in these critical years to find other work, to keep plants and personnel busy shows well the independence and resourcefulness that G. M. Overseas expects in its local managements.

Prewar supplies were shut off in 1940, and only emergency work could keep plants operating. G. M. Nordiska in Sweden first built acetylene generators to adapt carbide as a substitute motor fuel. It also built automobile parts and later even trolley cars.

G. M. Suisse carried on in the same way—building acetylene generators, converting old sedans to cabriolets, making knapsacks and powder bags, and reconditioning railroad-coach bodies for the Swiss Federal Railroads. This job carried the plant and its personnel through to '46, when part shipments from the U. S. put the regular assembly line back to normal work.

G. M. Overseas Postwar

The postwar period brought improvements and expansion to all G. M. Overseas organizations. General Motors-Holden's brought out a long hoped-for Australian-built automobile, the Holden, which was revealed late in '48 (McG-H Digest, Feb '49, p21).

The Holden, while designed in Detroit, is an Australian automobile built to meet Australian needs. Under agreement with the Australian government, only 10% of the automobile on list price or 5% by weight represents imported parts.

More than 400 Australian suppliers share with the six G. M. plants in making the Holden. Bodies and sheet-metal parts from the G. M. plant in Adelaide and engines and other components manufactured at Melbourne meet for final assembly at G. M. plants at Birkenhead, Sydney, Melbourne, Brisbane, and Perth. Last year Holden built over 20,000 automobiles, and this year target production is still higher.

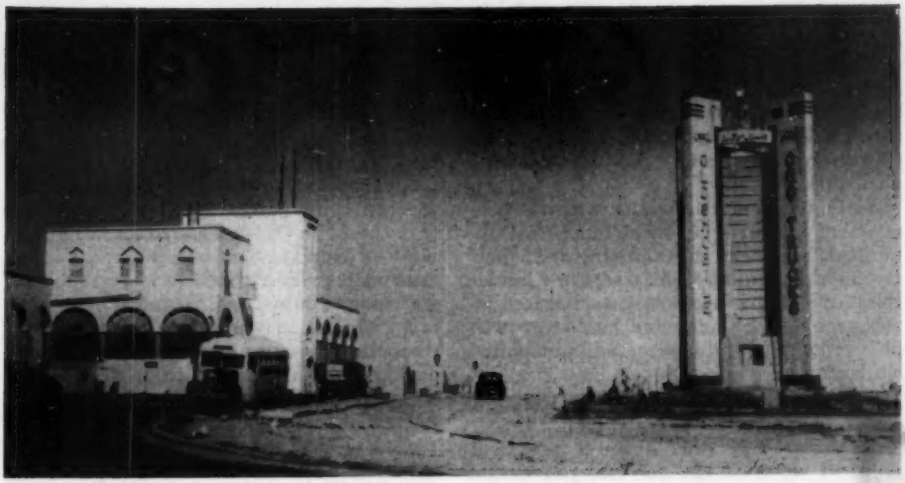
Australians look upon the Holden as a challenge to the industrial growth of their country and appreciate its significance to their national economy. It is one more example—and a good one—of what G. M. Overseas' executives regard as the integration of its operations into the economies of foreign countries.

Better Living, More Development

More and more countries are reaching for higher standards of living and greater industrial development. And G. M. Overseas has distinctly contributed to such endeavor in the countries where it is operating either manufacturing or assembly plants or branches and especially where it is doing more and more manufacturing in its assembly plants. Wherever G. M. has established such operations, it has meant the employment and training of labor, the purchase of local materials and power, the payment of import duties and local taxes, and the diffusion of wages into the local economy.

Training of workers in modern American technical methods—whether for Chevrolet assembly, Frigidaire manufacture, storage-battery production, servicing of products, or operation of diesel power plants—raises the general level of technical knowledge and skills. It is upon these skills that greater development of industrial capacity can feed and grow.

In community after community, it has



***SERVICE STATIONS** have followed automobiles and trucks practically everywhere in the world. This tall beacon of modern transportation is on the desert halfway between Cairo and Alexandria.*

been the same story. Skills are attained, local natural resources are developed, and new industries arise to supply at first the simpler parts and materials for the assembled products and later even some of the more complex components. More and more of each vehicle, or whatever the final product may be, is manufactured directly by G. M. or purchased from local sources, and less is imported from other countries.

Let's look at what this manufacturing policy does as it is carried along with the industrial growth of the community. It adds directly to the economic wealth of the country and, at the same time, requires less dollar exchange to buy the end product. This allows the importing country to bring in more goods for the dollar exchange available.

These are the direct benefits. But what about the indirect benefits that G. M. Overseas has brought to many countries that are relatively underdeveloped industrially? Automobiles, trucks, busses long have proved themselves to be indirect wealth producers. They create a demand for more roads and better roads. They open up back country areas. They abolish isolation and increase national integration.

The farmer can bring his produce to the city market and get to the stores to buy the things he needs. The doctor can reach his patients easier and faster. The mailman can deliver his mail. And not least of all, natural resources can be developed as the products of mines, timberlands, oil wells, plantations can roll to local industrial plants or to shipside for export to world markets.

A chain reaction of industrial and commercial development blasts the local economy into action. As one resource after another is opened up, employment spreads and the standard of living rises. Roads and bridges and filling stations call for materials and men. All this means that local industries are shored up by an important business-sustaining foundation.

As this transformation of local enterprise takes place, most countries realistically appraise their industrial poten-

tial. But, in some countries, the rising tide of nationalism causes their officials to overlook or disregard economic facts and to demand industrial expansion far beyond the capacities and resources available. This attitude, when carried to the extreme, can result in economic absurdities.

So G. M. Overseas, along with its program of encouraging local industrial expansion, has been a stabilizing influence. It has shown, and rightly so, that industrial expansion depends on progress in resource development and on the growth of secondary industries and technical skills.

Practical Industrial Expansion

If we look at this from a practical point of view, we can see that conversion to local manufacture of more and more of each automobile, for example, should not outpace those same factors. There is an "economic minimum" to the imported content of vehicles and other durable goods. Many of the important components of an automobile or truck—engine, clutch, transmission, rear axle—require for their manufacture a high degree of technical skill, complex tooling, extreme accuracy to assure interchangeability of parts, and, for economical manufacture, production in large quantities. Consequently, attempting to manufacture such parts in some countries is entirely unrealistic as well as impracticable.

Economic Minimum Varies

This percentage of goods manufactured or purchased locally varies from country to country, being zero of necessity in some countries and reaching up toward 100% in others. But because it is zero in any country does not mean that assembly of durable goods makes no important contribution to that country's economy. It still trains workers, raises purchasing power, pays taxes, and makes available the intrinsic value of the products themselves.

This same problem—that of unrealistic appraisal of a country's industrial potential, which can lead to unrealistic regulation by the local government—is common to many American companies operating in foreign lands. And it is important, not only to the American companies but also to the economies of the foreign communities. So it is well that this point be clearly recognized—that mass production demands mass consumption, basic primary industries, established secondary industries, management and labor skilled in planning and executing, financial resources, and reasonable political and economic stability. These conditions cannot grow or be decreed overnight. Most of them must evolve over a period of years.

Recognition of these facts—the demands of mass production and how they can be met only by natural progress—leads to economic realism. And economic realism in turn leads to a more favorable business climate, avoidance of restrictive regulations, and a true welcome to American business.

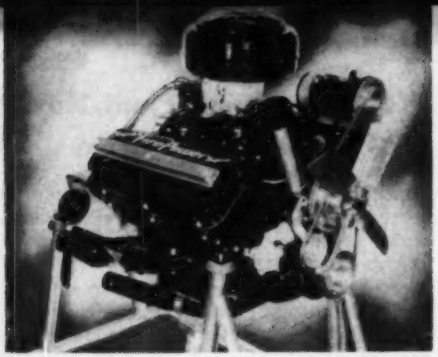
What Restrictive Regulations Do

Economic restrictive measures can do nothing but discourage the migration of American industry and technical knowledge. Whether we think of heavy discriminatory taxes or tariffs or of burdensome regulations, the answer is the same—a rigid barrier to production, to trade, to consumption, and to better living.

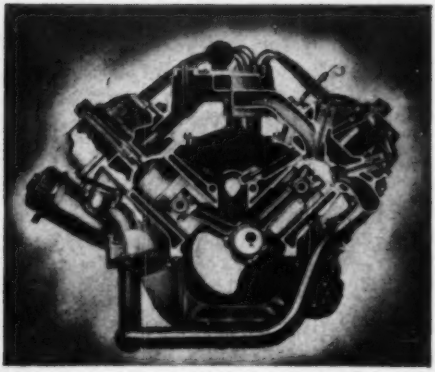
This then is the basis for the G. M. Overseas' concept of international trade—that the nations of the world should encourage the greatest possible volume of trade by facilitating the exchange of goods and services. International trade, according to G. M. management, should be based on mutual benefit and common progress. And it should provide the means of establishing as realities the prime objectives of more production, more consumption, and constantly expanding economies.

New V-8 Engine Gives 180 Bhp.

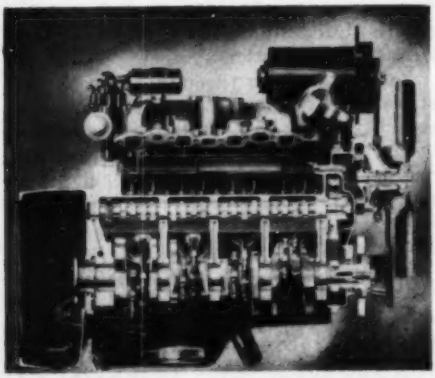
New automobile engine introduced by Chrysler Div., Chrysler Corp., features high performance, high compression, overhead valves, and a V-8 block. Weight of the V-8 is 5.13 lb./bhp. as compared with 7.42 lb./bhp. for the in-line 8. Power has been raised to 180 bhp. Fuel economy is 10% higher than for in-line 8. Combustion chamber is hemispherical and has a lateral valve arrangement. Push rods and rocker arms operating on twin rocker shafts permit widely separated valves and location of spark plug near the geometrical center of the combustion chamber.—Auto Ind, Feb 1, p38



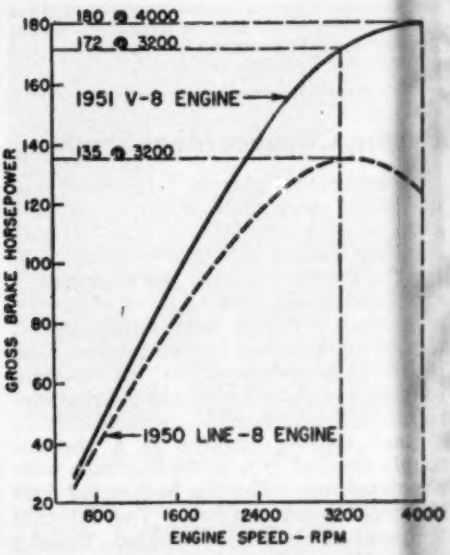
ACCESSORIES of new engine include double-breaker distributor for hotter spark at high speeds. Engine has dual carburetor.



CROSS SECTION shows arrangement of valves, rocker shafts, and hydraulic valve lifters. Spark plug is enclosed and sealed.



LONGITUDINAL SECTION shows short, rigid five-bearing crankshaft. Cylinder block structure is stiff in all planes.



V-8 VS. IN-LINE 8 CURVES indicate superior performance of V-8. Compression ratio is 7.5/1. "Regular" fuel can be used.

SPEEDS LIGHTING MAINTENANCE

Removable seats suspended from an ordinary floor-operated bridge crane are simplifying the cleaning of fluorescent fixtures at Warner & Swasey Co. A seat is hung from each end of the bridge, directly under a line of lighting fixtures. One man works on each of these seats. The control box is placed on one of the seats, so one man is able to control crane movement.—Factory, Jan, p140

Better, Cheaper Meat Smoking

Measuring the internal temperature of meats and meat products during smoking and cooking operations has reduced smoking time by 15% for Weiland Packing Co. Product quality has improved.

System is based on 12-point electronic strip-chart recorder that guides operation of smokehouses and cook-boxes. The recorder is connected to ten thermocouples and four additional sensing elements.

Each sensing element is a thermocouple encased in a protecting tube with a pointed tip. The tip is inserted into the meat being smoked. The internal temperature is thus indicated, thereby eliminating undercooked portions in the center and avoiding overcooking.—Food Ind, Jan, p75

Water Softening Plant Has Sea-Water Regeneration

Sea water regenerates sodium-zeolite softeners in the new Jacksonville Beach water plant. Making use of free-of-charge ocean water—instead of purchased salt for regeneration—results in considerable operating savings.

Fresh hard water for the domestic consumption is drawn from three wells. The raw water is aerated to remove hydrogen sulfide. It is then stored in an underground reservoir.

Transfer pumps with suctions to this reservoir force aerated raw water through the sodium-zeolite softeners to soft-water storage. The softeners contain styrene-base resin zeolite.

The sodium-zeolite units produce a water with zero hardness. But the plant is designed to turn out 2 mgd. with a 4- to 5-gr.-per-gal. hardness. This is done by automatically blending 25% raw water with 75% zero-hardness water at all times, irrespective of flow through softeners.

A solution of neutralized polyphosphate is fed to the final blended soft water for stabilization. This solution prevents corrosion problems in the distribution system. Blended and stabilized water is stored underground. After chlorination, high-service pumps deliver it to the distribution system.

Sea water flows through a porous well strainer to a concrete sump and asbestos-cement pipe. Deep-well turbine pumps in the sump connect to filters that discharge directly to piping serving the softeners. The pumps are piped and valved so that the buried intake strainer can be backwashed.

The two sea-water filters have a 42-in. bed of sand and gravel and are equipped with manually operated hydraulic-type multiport valves. This permits backwashing when pressure loss through filters becomes excessive.—Eng News-Rec, Feb 1, p46

New Color Television Tube Shows Better Color Fidelity

New three-color picture tube made by Radio Corp. of America operates on the same basic principle as the earlier version (McG-H Digest, July '50, p29), but it has marked improvement in color fidelity and image structure. It now has 200,000 holes in the metal mask behind the phosphor screen instead of 117,000, and the phosphor screen has 600,000 phosphor dots instead of 351,000 in earlier demonstrations.

Red and blue phosphors in the new tube have a higher light output, which permits a proportionate increase in the brightness of the red and blue primary images. Highlight brightness ranges up to 20 footlamberts compared with the previous 5 footlamberts.

Another improvement is the substantial reduction in the visibility of the dot structure. This reduction is due to adoption of the Hazeltine by-passed monochrome transmission method.

The tricolor tube, in a press demonstration, did not reproduce highly saturated reds and blues as well as the Columbia Broadcasting System's rotating-disk system. But the gap between phosphor colors and filter colors has been narrowed so that either is satisfactory from a commercial standpoint.—Electronics, Feb, p80

Speeds Evenness Analysis

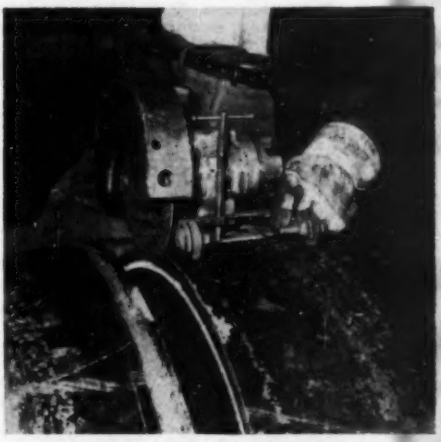
A Saco-Lowell sliver tester converted by the Southern Regional Research Lab. records evenness of sliver being tested. The strip-chart recorder was replaced with a series of 30 electrical counters so arranged that there is one counter for each of the 30 spaces found on the conventional chart.

As the sliver runs through the tester, a contact point on an arm moves up and down a set of insulated copper bars that are connected to the counters—each bar to its own counter.

A timing device momentarily turns on an electric current at pre-set intervals. The counter that is connected to the copper bar touching the contact point at that moment will register. Measurements in terms of 0.001 in. will automatically be tabulated on the counters. The fewer counters affected, the more uniform will be the sliver.—Textile World, Jan, p120

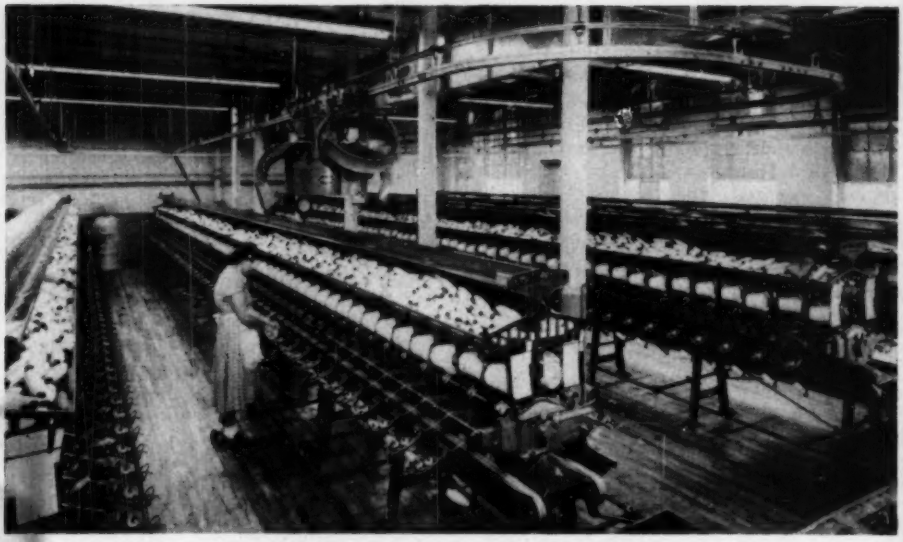
Can Has Transparent Walls

Unpolished extruded acetate is used in packaging frozen oysters and fish by Airfresh, Inc. Conventional crimped-on metal ends seal top and bottom of the can. Chief advantage of the new container is its merchandising appeal. Complete visibility allows people to see what they are buying and since seafood is a perishable commodity, visibility of the product is an important sales stimulus.—Mod Packaging, Dec, p83



AIR GRINDER CUTS PIPE

This clever idea on cutting cast-iron pipe will reduce cutting time over conventional methods. A grinder motor, made by Independent Pneumatic Tool Co., was mounted on a metal base equipped with rollers. The abrasive disk takes a ⅝-in. cut, making eight cuts every 9 hr. on 30-in. pipe.—Foundry, Jan, p132



AUTOMATIC CLEANING PAYS DIVIDENDS

Gastonia Combed Yarn Corp. first installed automatic overhead cleaning in one of its mills to improve the yarn quality and appearance. Now it finds that the labor cost for cleaning the ceiling is virtually eliminated. An overhead cleaner, shown suspended from a monorail above the machines, automatically travels along the track cleaning the machines as it goes.—Textile World, Feb, p126

Get Long Life from Timber

After considerable study and long experience, Glen Alden Coal Co. has built their own wood-preserving plant. Economy and immediate usability of the treated timber for their mine are features of the new system.

The Osmose process was selected because of its economy. Wood is alternately steamed and subjected to a vacuum in a retort. Then the wood is surrounded with an Osmosalt solution. Initial penetration is accomplished in this treatment and the timber is ready for immediate use.

Plant layout was carefully designed to make use of existing facilities. Power, steam, and trucking and rail facilities were available. An existing craneway was extended to cover the plant area. Two sets of retort cars make it possible to unload a finished charge and load a new charge while a charge is being processed.—Coal Age, Jan, p74

LPG Means Less Repairs

A trucking company in Texas found that use of liquefied petroleum gas (LPG) in trucks reduces frequency of engine overhaul. Two identical trucks were tested. One with a conventional gasoline engine needed a complete overhaul at 40,000 miles. The second truck, converted to LPG, has been driven 80,000 miles and used uncounted winch hours without any repairs yet needed. The first engine was converted to LPG when it was overhauled.—Oil & Gas J, Feb 1, p34

High-Temperature Lubricants

Modern lubricants for high-temperature service become increasingly important as processes are mechanized and process temperatures rise

LUBRICANTS for high-temperature service are finding wider application in the chemical-processing and many other industries. Three important classes are silicones, fluorolubricants, and molybdenum-based lubricants.

Silicone Lubricants—Most important of the synthetic lubricants, silicone oils and greases are characterized by heat stability, oxidation resistance, chemical inertness, low volatility, high flash point, and water insolubility.

Fluid silicone lubricants come in three types. Type A, a general-purpose lubricant for service up to 500° F., is used on conveyor bearings, oven machinery, similar equipment. Colloidal graphite suspended in the fluid increases the temperature limit.

Type B, for temperatures from—54° to 300° F., is intended for light to medium loads. It is used on conveyor chains and instruments.

Type C is useful mainly as a hydraulic fluid and is available in viscosity grades from 100–30,000 centistokes and higher. It has limited loadcarrying capacity where both sliding surfaces are ferrous. Other uses are liquid dielectric, mold release agent, water-proofing material, and special purpose lubricants.

Silicone greases are available in four grades. Grease A contains heat-stable silicone fluid thickened with finely divided carbon. Uses: conveyor systems and other slowly moving equipment operating at high temperatures.

Grease B, a soap-base grease, is made from a silicone oil with a low freezing point. It is designed for use in ball and roller bearings operating at temperatures from —100° to 300° F.

Grease C is intended for permanent lubrication of high-speed, high-temperature ball bearings. Grease D, a translucent grease made from silicone oil and silica, lubricates valves and packings exposed to a variety of corrosive materials at high and low temperatures.

Fluorolubricants—These synthetic lubricants are low-molecular-weight arborizations of the fluorothene polymer tree. Their heat stability—better than 600° F. —is superior to that of the silicones. When they do reach decomposition temperature, they vaporize completely, leaving no residue. A disadvantage is their poor viscosity index compared with those of silicones and ordinary lubricating oils.

Fluorolubricants are available in forms from oils to waxes. They are largely experimental, several grades being available only in pilot-plant quantities at high prices. Chief uses are for equipment handling liquid oxygen and other highly reactive materials.

Molybdenum-based Lubricants—Latecomers in the lubrication field, these materials carry molybdenum in a volatile hydrocarbon. The hydrocarbon evaporates when subjected to high temperatures, leaving behind the molybdenum, which adheres tightly to metal surfaces and withstands temperature extremes.

The liquid lubricant employs a glycol derivative as the carrier. Appearance and consistency are about the same as SAE 30 lube oil. The glycol vaporizes at 800° F. with less than 0.01% carbon. The molybdenum left behind is satisfactory up to 1200° F. for short periods. For this reason, it is applied for hot extrusion of steel.

Molybdenum-based grease has practically the same properties. Uses include sealed ball bearings, kiln cars, gear boxes, speed reducers, and similar equipment.—Chem Eng, Feb, p184

How To Prevent Loom Stops In Preparation of Warps

Loom production and efficiency can be improved by preventing loom stoppages. And loom stoppages can be prevented by good preparation of warps and filling.

Here are some ways to stop loom stoppages before they have a chance to start:

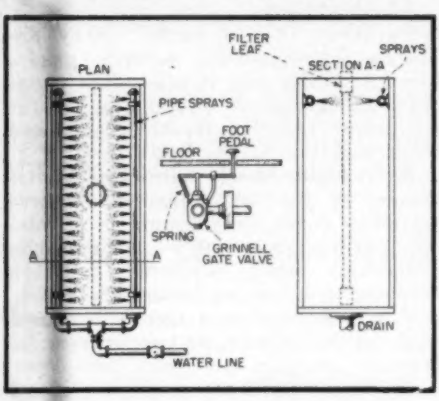
• Tie good knots—A knot that slips or has a long tail may tangle up and break out a number of ends.

• Size some warps—Sizing will sometimes increase production on certain kinds of worsted. Hard weaving fabrics that have a tendency to make knots slip are helped by sizing.

• Drop wires before loom—Dropping wires before the warp is placed in the loom is one way of increasing production. A combination frame for dropping wires and drawing in the warp is easily constructed.

• Prepare the loom—Preventive loom-fixing is the best way to keep production high. Make repairs and adjustments before any trouble occurs.

• Prepare unit spare parts—Making up spare parts and having them ready for quick installation will also save time. —Textile World, Jan, p102



SPRAYS CLEAN FILTER LEAVES

Spray installation for cleaning 5x8-ft. Moore filter leaves in the cyanide plant of Howe Sound Co. consists of a wooden rectangular tank with two built-in pipe sprays, and a Grinell gate-valve assembly to control water flow. Filter leaves are handled by a small electric hoist installed above the tank. The leaf is lowered into the tank by the hoist. Then the gate valve is opened until the entire leaf has been raised out of the spray zone of the tank. Time consumed: 25 sec. Conventional methods required 15-20 min. with two men employed.—Eng & Min J, Jan, p94

Polyethylene in Car Springs

Two automobile manufacturers are now using polyethylene as a spring liner material. It has proved to be durable, economical, and quiet in operation.

Spring Perch Co. makes the liners in the form of an extruded strip with a cross section like an elongated I. That is, the liner has built-in flanges that fit around the edges of the spring leaves.

The flanges keep the spring assembly in permanent alignment and seal out dirt. Rebound clips can be eliminated from the spring.

The polyethylene liner is quiet in operation because of its self-lubricating waxy surface. Extremes of heat and cold do not affect this feature.—Mod Plastics, Feb, p64

How to Cure Motor Burn-Outs

Low power factor can do more than raise a company's electric bill. At the Macco Construction Co., operator of a quarry, rock crusher, and hot-batch asphalt plant, a power factor of 55% caused excessive voltage drop and motor burn-outs.

This condition was cured by installing capacitors to raise the power factor from 55% to a minimum of 65%. Elimination of the power-factor penalty alone was calculated to absorb the cost of the capacitor equipment in 3 years. Because of the improvement in power factor, the transformer bank was able to take an increased load without the installation of additional capacity.—Elec West, Jan, p61

Effect of Oxygen Content on Iron-Casting Properties

Casting defects, such as hard castings, porosity, internal shrinkage, cold shuts, cracks, and hot tears, can often be traced to poor pig iron. A major factor is dissolved oxygen.

Variations in blast-furnace practice that produce a variable degree of oxidation occur even under best operative conditions. Also, even when pig iron quality is good, oxidation is always dangerously possible during cupola melting. Other materials too, as porous or rusty scrap, oxidized ferroalloys, or the coke, may carry excessive amounts of oxygen into the cupola charge.

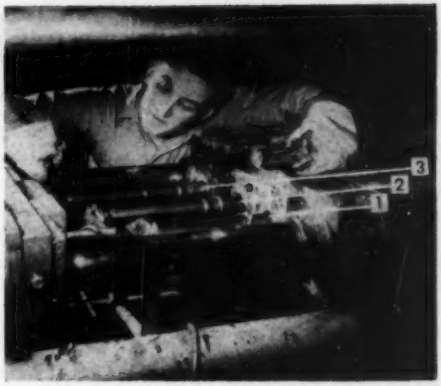
Therefore, the solution appears to be the addition of sufficiently strong deoxiders to the melt. The successful deoxidizer can be measured by these requirements:

1. Active enough to react with dissolved oxygen or oxides and reduce their concentration.
2. Capable of being brought into contact with the iron long enough for reaction to take place.
3. Deoxidation reaction must not produce harmful by-products.
4. Ordinary amounts of residual deoxidizer dissolved in the iron must be harmless.—Foundry, Jan, p100

Jet Weather Forecasted

Australian Dept. of Civil Aviation is setting up a network of 15 radar stations in Australia and New Guinea. Radars will track course of meteorological balloons enclosed in silver-treated nylon mesh.

Plotting balloon's courses enables wind velocities to be determined up to 40,000 ft. so meteorological services can be provided for high-flying jet airplanes. Radar also will detect heavy cumulus thunderstorm clouds.—Electronics, Feb, p282



STEEL BARS are extruded from middle toward both ends to form transmission shafts as . . .

Cold Extrusion of Steel Is Applied to Automotive Work

Transmission shafts are being cold extruded from steel at Molloy Mfg. Co. This is one of the first commercial applications of cold extrusion of steel.

One result is that material requirements are one-third less. Furthermore, a lower grade of steel can be used with no sacrifice in quality because of the superior properties produced by cold extrusion. A third benefit is that shafts, held to 0.001-0.002 in., require only finish machining.

Medium-carbon, 1¼-in. bar stock, heat treated to 100,000-psi. tensile strength, is cut to 14-in. lengths. Bars are coated with zinc phosphate, which acts as a lubricant during extrusion.

Actual extrusion is done from the middle toward both ends in three-station carbide dies, preferably in horizontal hydraulic presses. The phosphate coating still remains on the part after the third extrusion stage. All circular forms, such as tapers, fillets, and cylindrical steps, are produced to specified limits on all parts.—Am Mach, Feb 5, p173

Mass Marquenching of Gears

Interrupted quenching of gears has speeded production and provided parts with much longer life and greater load-carrying capacity

MASS MARQUENCHING is being exploited by International Harvester Co. in its $1-million heat-treating department at its Ft. Wayne Works. Five radiant-tube gas carburizers are employed to mass-marquench transmission gears, differential side gears, side pinion gears, king pins, and miscellaneous shafts. (Marquenching is a coined word for a process using an interrupted quench.)

Two years ago the first transmission gears and parts were marquenched. Since that time, many other parts have been adapted to marquenching.

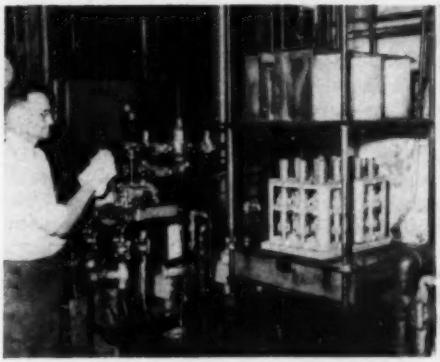
About 75 different parts are now being processed. They range in weight from ½–12 lb. and have solid sections from ½–2½ in. The variation in weight, size, and design presented problems in establishing proper quenching and economical production flow.

The governing factors are furnace temperature, carbon concentration, agitation of quenching oil, time cycle in quench, and transformation period. Carefully controlling these factors results in fewer quenching stresses and less distortion.

Gears can be marquenched within tolerances without the need for quenching presses, plugs, and special fixtures. Their service life is increased from 100-200% and their load-carrying capacity from 15-20%.

The five carburizers are the two-row continuous type, containing 21 trays per row on which the work is automatically charged into the furnace. Furnace atmosphere is a combination of RX gas and natural gas.

The quench tank is a 1,600-gal. unit located directly under the side discharge door. It is designed so the flow of oil is greatest at the submerged work level of the Lowerator that carries the work. Oil



***TRANSMISSION COUNTERSHAFTS** that have been carburized are being lowered into the marquench bath. These shafts were formerly quenched individually in conventional process, but that is no longer necessary.*

temperature is held at 400° F. ±2° F. by six radiant tubes that can heat or cool.

When the work is raised from the oil, it is moved from the Lowerator to a roller conveyor where it is transferred to mesh baskets. Work is held in the baskets until transformation is completed—sometimes as long as 5 hr.

Baskets are then placed on a power-driven conveyor and carried through the wash and temper units. All marquenched parts are tempered for 1½ hr. at 300°F. End result is a fine-grained martensitic case structure.

A typical marquenched part is the first-speed countershaft gear. Composition is 0.21 C, 0.76 Mn, 3.45 Ni, 0.08 Cr, 0.23 Si, and 0.25 Mo. Gear is carburized at 1700°F., quenched at 400°F., cooled for 4 hr. at room temperature, washed, and tempered at 300°F. for 1½ hr. Hardness on teeth surface is 60½ Rockwell C with a core hardness of 43 at pitch line and 38 at root line.—Steel, Feb 12, p72

White-Liquor Preparation Subject at Pulping Meeting

The technical session on causticization at a recent meeting of the Technical Pulp and Paper Industry dealt with white-liquor preparation and included:

Green-liquor Clarification — Adding magnesium sulfate to green liquor in the clarifier causes flocculation and a reduction in iron and silica content. Another point brought out was the possible benefit of silica in preventing corrosion of digester walls.

Sludge Settling—Efforts to increase the yield of caustic reaches a point of "diminishing returns". This point can be raised by reducing concentration, but too much white liquor may have to be used.

White-liquor volume in the digester charge should not exceed two-thirds the total liquor volume because presence of added black liquor favors the pulping reaction.

White-liquor Turbidity — Discussed were results of two pilot cooks—one with average mill liquor and the other with a synthetic liquor made by absorbing dry hydrogen sulfide in a solution of flake caustic soda.

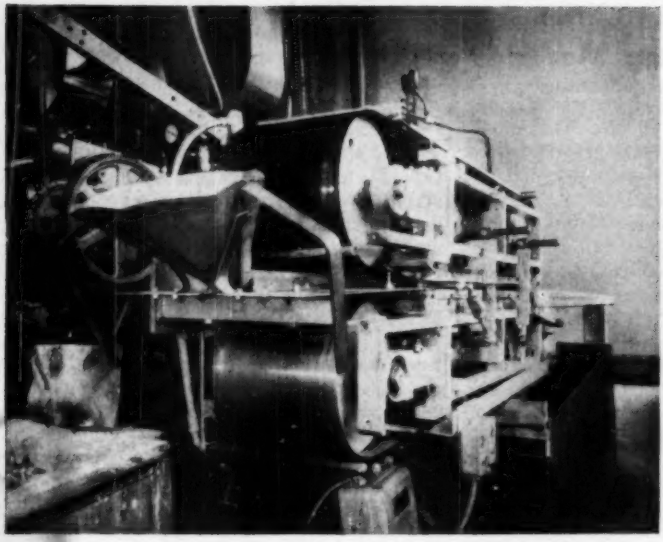
The clearer liquor gave a softer pulp, which hydrated more readily and attained higher bursting and tearing strengths than did the more turbid liquor. Possible reason is that suspended matter inhibits liquor penetration into chips.—Paper Ind, Dec, p983

Degasifies Stainless Steel

Ferroselenium has proved successful as the final degasifying agent in making 18–8 stainless steel in high-frequency electric furnaces. It prevents gas porosity of the reducing-gas type frequently experienced from high hydrogen or nitrogen contents. Amount added is ¼ lb. per ton, or 0.0125%. Selenium up to about 0.10% does not affect physical or mechanical properties, welding characteristics, or corrosion resistance.—Foundry, Feb, p126

MAKING HOT TIE-IN ON PIPE LINE

Cutting out a section of pipe line filled with natural gas and making a hot tie-in are possible, but cutting and welding are done in a circle of flames. With only a small pressure in the line, pipe is pierced and cut (left) while escaping gas burns—and it must be kept burning. If it goes out, welding must stop. Operators wear asbestos suits. After cut is completed, it is sealed off (right) by wet canvas wrapped around pipe until weld is to be made. This keeps air out of the line. Pipe line is purged before new section is welded in place with a butt strap.—Weld Eng, Jan, p20



CASTING METAL IN MOVING MOLD

Improved continuous-casting machine developed by Hazelett Strip Casting Process Co. has moving mold consisting of two steel belts revolving over drum pulleys. Outside of each belt is water-cooled. Metal from ladle (left) runs into cavity between belts and solidifies as it moves forward. Aluminum and brass and maybe steel and magnesium can be cast.—Iron Age, Jan 25, p53

Aseptic Canning Process Prepares Split-Pea Soup

As one of the first food processors in the field to adopt aseptic canning, Andersen's Food Co. is now preparing split-pea soup by the Martin process. This process provides heat treatment of a severity several times greater than necessary for complete sterilization.

Utilized is a combination of high-temperature short-time sterilization and aseptic canning methods. The product is quickly sterilized and cooled before being sealed in cans. The process consists of:

1. Sterilization of the cooked soup under 1,800-psi. pressure at 290°F. in a heat exchanger, holding for 8.8 sec., and cooling to 90° F. in 14 sec.

2. Sterilization of cans and covers in an insulated tunnel with steam superheated to 400–600° F. Maximum can temperature reached is 425° F.

3. Filling of cold sterile product into sterile containers. Cans are conveyed under a horizontal slit-type continuous filling nozzle. Temperature within filling enclosure is 300° F.

4. Aseptic sealing of cans with sterile covers in an enclosed closing machine with a maintained temperature of 230° F. —Food Ind, Feb, p72

New Rotary Air Compressor

Ingersoll-Rand Co.'s new air compressor has no valves, no pistons, no rings, no clutches, no intercoolers, no aftercoolers, —but twice as much air as ever came out of a portable compressor of comparable size.

Here is how it works. Non-metallic vanes slide freely in slots in rotors that revolve inside off-centered cylindrical chambers. Vanes are held against cylinder walls by centrifugal force. Secret of rotary design is flooding entire works with oil serving both as a lubricant and coolant, which is then separated out in the receiving tank. No intercooler or aftercooler is necessary.—Const Meth & Equip, Feb, p87

Recovery Method Promises More Oil from Old Fields

Carbon dioxide, the gas that puts the sparkle in soft drinks, may bring new life to old oil fields. The technique, developed by Oil Recovery Corp., is known as the Orco process.

Carbon dioxide in a water solution is injected into the oil-bearing formation in input wells. The company claims that the carbonated water, combined with an unrevealed "helper", modifies the condition of oil sands so the oil is more readily recoverable than by present water-flood procedures.

The process shows promise of potential importance in obtaining a "third crop" of oils from fields exhausted by other methods of primary and secondary recovery. Although the method is not ready for general use, field tests have been satisfactory.

Core studies indicate that the technique will reduce the fraction of irrecoverable oil to a new low of 10% of pore space. This would amount to recovery of two-thirds of the oil now left in the oil-bearing formations of some depleted fields.

The Orco process will probably also be used in conjunction with water-flood projects. Another possible application is as a supplement to primary production methods. The process may also be of value in recovering hydrocarbons from oil shales and tar sands.—Oil & Gas J, Jan 25, p171

Needs No Starter or Ballast

Combination fluorescent and incandescent lighting unit, developed by Philips Co. of Holland, has no starter or ballast, yet starts instantly. It has a 40-watt fluorescent and a 68-watt tungsten incandescent lamp in series. The tungsten lamp stabilizes the arc in the fluorescent tube.

Ignition is performed by an auxiliary electrode inside the fluorescent tube. It consists of a semi-conductive strip connected to one arc electrode and extending near enough to the other electrode for ionization to occur across the gap at 200 volts and thus to initiate the arc almost immediately.

The unit is offered in a fixture of two fluorescent tubes side by side with incandescent lamps at the ends. Output efficiency is 26 lumens per watt, as compared with 40 for a fluorescent lamp alone.—Elec World, Jan 1, p82

Convention Calendar

(Equipment Exhibited)

Apr 30-May 11—British Industries Fair, London and Birmingham, England

Apr 30-May 4 — National Materials Handling Exposition, Chicago, Ill.

May 14-17—American Mining Congress Coal Convention and Exposition, Cleveland, Ohio

May 28-June 8—Canadian International Trade Fair, Toronto

June 18-22—American Society for Testing Materials Annual Meeting, Atlantic City, N. J.

Sept 10-23 — International Trade Fair, Chicago, Ill.

Oct 15-19 — National Metal Congress and Exposition, Detroit, Mich.

Oct 22-26 — National Business Show, New York, N. Y.

Nov 5-8 — Refrigeration Equipment Manufacturers Association Exposition, Chicago, Ill.

Nov 26-Dec 1—National Chemical Exposition, New York, N. Y.

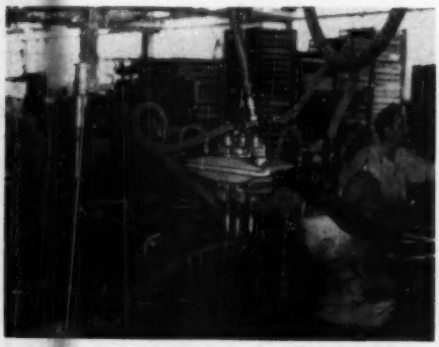
To anyone interested in any of these exhibitions, either as a possible exhibitor or visitor, the McGraw-Hill Digest will be glad to furnish additional information.

Technical Shorts

Zirconia Applications — Stabilized fused zirconia, being marketed by Norton Co., will have a 1951 output 24 times that of '49. Main present use is firing of barium titanate insulators. Other possible applications: cracking of gases, direct synthesis of nitric acid. Top working temperature of zirconia is 4700° F.—Chem Ind Week, Jan 20, p11

Largest Ceramic—General Ceramics & Steatite Corp. believes it has produced the largest piece of ceramic ever fired. It is a porcelain cylindrical tank of 750-gal. capacity, 8 ft. high, and 4-ft. ID.—Ceramic Ind, Feb, p73

Longest Gas Line—Natural gas is now flowing to New York City in the world's longest gas pipe line. The line, built by Transcontinental Gas Pipe Line Co., is 1,840 miles long and 26 and 30 in. in dia. Its completion means the first major use of natural gas in the New York area.—Oil & Gas J, Jan 18, p99



NUT RUNNER CUTS ASSEMBLY TIME

A multiple-spindle electric nut runner, suspended above the rear axle assembly at Lincoln-Mercury Div., Ford Motor Co., saves 65% on assembly time. Counter-balancing the nut runner makes handling easier. Nuts are started by hand, and all of them are run down and tightened in one operation. Simultaneous tightening prevents misalignment.—Factory, Jan, p128

Better Beer—Quality-minded brewers find that cleaning and sterilizing air entering wort cooling and fermenting rooms improve beer flavor and keeping quality. Pfeiffer Brewing Co. passes all air entering wort cooling room through a precipitron, exposes it to bactericidal ultraviolet lamps, and keeps the room under a slight pressure to avoid leakage in of untreated air.—Food Ind, Feb, p75

Salvage Boiler Flues—When the Toledo, Peoria & Western RR converted from steam to diesel, it salvaged the boiler flues from each steam locomotive. Now the railroad has a supply of high-quality steel piping that cost practically nothing and has many uses.—Railway Eng & Maint, Feb, p134

Storing Peeled Wood—Swedish lumber experts report that peeled aspen and birch have been stored successfully for as long as 3 yr. in pulpwood piles. Also, predrying reduces decay of wood in larger piles in mill yards. Predrying in the woods is not especially beneficial.—Paper Ind, Dec, p971

Keeps Chicks Warm—Large-scale chicken brooding can be done successfully with electrically heated floors in brooderhouse. Four-inch fill is covered with felt and 3 in. of insulation mix. Then soil heating cable is placed on mix and covered with 1-in. concrete top as the radiant heating slab.—Elec World, Jan 29, p178

Turbojet Starting Power—Jet engines delivering more than 9,000-lb. thrust will require starting power in excess of 100 hp. for a 20-sec. start and in excess of 1,000 hp. for a 3-sec. start. High-powered air starters and cartridge starters are being investigated.—Auto Ind, Feb 1, p35

Diesels Make Money — Municipal Power Plant, Newton, Ill., lost $4,000 a year with steam plant of 1898 vintage. So it installed three 800-hp. Nordberg diesel engines direct-connected to 560-kw., 3-phase, 60-c., 2,400-v. generators. Profits for 1950 were $57,300; estimated profit for 1954 is $79,900. —Oper Eng, Feb, p28

Bonds Rubber to Metal—In Redux process, just announced by Natural Rubber Bureau, rubber surface is treated with concentrated sulfuric acid, washed in running water, dried, painted with liquid resin, and dipped in powder. Rubber and metal are clamped together under 50-psi. pressure and heated to 140° C. for 20 min. —Am Mach, Jan 22, p115

Continuous TEL Process—Du Pont has just announced a new continuous process for making tetraethyl lead. It will increase output and also eliminate need for equipment made of special steel alloys as required in the batch process.—Chem Eng, Feb, p208

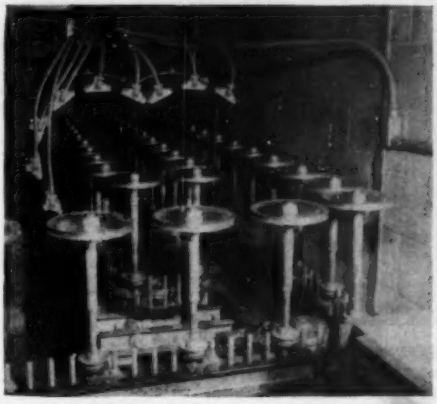
Good Filter Element—According to Goodyear Tire & Rubber Co., shredded plastic makes such an efficient filter that it traps and holds the microscopic solids in cigarette smoke. It is suitable for filters in hot-air furnaces and air-conditioning units.—Factory, Feb, p92

Aluminum at Sea—More than 2-million lb. of aluminum went into the superstructure of America's largest ocean liner, the S. S. United States. This is the largest application of aluminum ever made in the marine field.—Iron Age, Jan 18, p11

Anchor Bolts in Concrete—To overcome turning on the part of the bolts that are used to anchor wood plate to concrete, bend the bolts about 3 in. from the threaded ends before they are inserted in the concrete.—Am Builder, Feb, p56

Underground Auger Mining—A definite start was made in 1950 on augering underground. One installation employed a machine designed to work both ways from the same opening. Later, it will be modified to bore both above and below a parting simultaneously.—Coal Age, Feb, p80

Handbrake Energizes Self—Internal-expanding automobile hand brake, designed by Chrysler Corp., gives three times braking effort of external-contracting type. Increased effort results from self-energizing action of both brake shoes. As shoes tend to rotate, they force themselves tighter against drum, thus multiplying hand braking force.—Prod Eng, Feb, p132



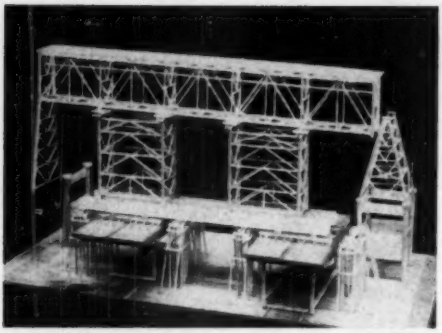
INFRARED SPEEDS LACQUER DRYING

All-metal, "glass-less" infrared heating installation over spray-booth conveyor at Advance Tool & Die Casting Co. dries laquered pulleys, automative parts, power-tool casings, and similar items. Nine 7-ft. Chromalox RAD-7361, 230-v., 3,600-w. units are mounted in a confined space between spray booth and building wall, thereby creating a "tunnel" effect. Maintenance is low as there are no lamps to break.—Elec C&M, Jan, p46

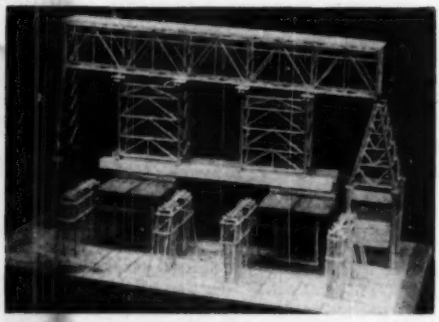
Cools Pilot—Suit, developed at Institute of Aviation Medicine, Eng., employs evaporation principle to cool pilot. Perspiration is evaporated by a slow flow of cooling air next to pilot's skin. Series of tubes run through the undersuit to 92 different vents located at points on the body where perspiration is normally secreted.—Aviation Wk, Feb 12, p34

Conductive Phenolic—Unique property of a phenolic developed by Durex Plastics & Chemicals, Inc., is its ability to be directly electroplated. Conventional plating methods can be used. Adherence between electroplated metal and phenolic is said to be excellent. Corrosion resistance is high.—Mod Plastics, Feb, p60

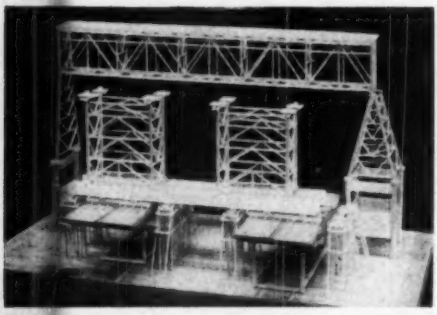
New Car for Brazil—State government of Minas Gerais, Brazil, is encouraging the establishment there of a small automobile factory by Auto Fabrik Muenchen, Munick, Germany. If plan is carried out, factory will be Brazil's first self-contained automobile plant.—Mach, Feb 10, p214



ERECTED ON FALSEWORK, first deck truss span of Chesapeake Bay Bridge is readied for floating to place on piers alongside



PICKED UP BY BARGES that maneuver themselves by anchor and mooring lines, truss is inched sideways into bridge



LANDED ON BRIDGE PIERS, first span will serve as erection dock—travelers to be set up on deck will build other trusses alongside

Span Serves as Erection Dock

Contractor erects 19 trusses from one truss serving as erection dock. Barges float each truss into place

SUPERSTRUCTURE CONTRACTOR, Bethelehem Steel Co., has worked out some clever erection techniques for 19 truss spans of Maryland's Chesapeake Bay Bridge. Here is the procedure:

- Build a single group of falsework just off the bridge line.
- Erect the first span on falsework.
- Float the completed span to its final location directly alongside the falsework.
- Fit the span with stiffleg derrick travelers.
- Use these travelers to erect the rest of the spans on the same falsework.
- Float them to place in the bridge as they are completed.

Balsa-wood models (pictures) to scale were made to verify plans.

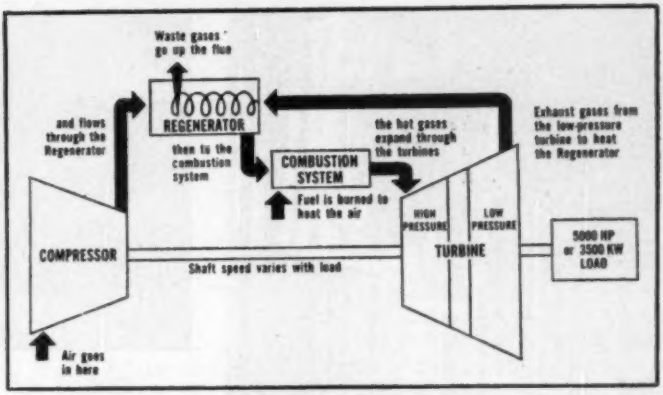
Floating complete spans into place has been done before, but never with the size and number of trusses that Bethlehem is handling at one spot. And erecting the spans with derricks on the bridge itself is a novel procedure that eliminates much floating equipment.

An advantage of the off-line scheme of locating the falsework was that falsework construction and erection of the first truss could start before its piers were completed, and without interference to the substructure contractor.

All spans are erected at the same grade and elevation as their final position in the bridge, so falsework towers are of different heights. Bolted splices in the tower legs and diagonals allow addition or removal of sections so that the correct tower height is reached.—Const Meth & Equip, Feb, p46

GAS TURBINES FOR GAS LINES

Centrifugal compressors on El Paso Natural Gas Co.'s system may be driven by gas turbines. Plans call for initial installation of seven 5,000-hp. General Electric units plus a total of 140,000 hp. later. Turbines will be of regenerative-cycle type. No turbines of this type have yet been installed in commercial service. —Oil & Gas J, Jan 25, p169


Waste gases go up the flue
REGENERATOR
and flows through the Regenerator
then to the combustion system
COMBUSTION SYSTEM
Fuel is burned to heat the air
the hot gases expand through the turbines
Exhaust gases from the low-pressure turbine to heat the Regenerator
HIGH PRESSURE
LOW PRESSURE
COMPRESSOR
TURBINE
Shaft speed varies with load
5000 HP or 3500 KW LOAD
Air goes in here

Lengthen Your V-Belt Life with These Dozen Easy Tips

If you want to save your V-belts, here are a dozen tips that will help you do it:

Overtension—Tight belts mean short life. Do not eliminate sag to the point where belts are strained.

Undertension—Loose belts slip, and slipping in sheaves' grooves causes excessive wear and heating.

Unequal Length—When belt lengths vary too much, belt loading cannot be equalized. Keep strands within recommended inspection numbers.

Idle Belts—Belts that stand idle for long periods set to sheave shape.

Old Belts—Rubber belts loose part of useful life if left on shelf too long.

Dirt—Keep belts clean as dirt increases wear.

Atmosphere—Oil vapors and acid fumes injure some rubber belts.

Sheaves—Out-of-line sheaves cause slippage, distortion, internal heating.

Sheave Grooves—Worn sheaves puts excessive tension in the belts to drive the load.

Rough Grooves—Keep groove sides smooth to avoid heavy belt wear.

Starting Overload—Momentary tension in belt is caused by starting under high overload. Result: slippage and possible belt breakage.

Vibration—Driving- or driven-machine vibration may cause whipping or snapping of belts.—Oper Eng, Feb, p30

New Chemicals Offered

▶ Silicone-based enamel, a hybrid between porcelain and plastics, is announced by Glidden Co. It has the surface hardness and chemical resistance of porcelain without its brittleness. It has withstood a fog of 20% salt-water solution for 4,000 hr. at 95° F. with no effect. It will be available commercially in a year.

▶ Poultry and swine will thrive and grow faster on antibiotic feed supplement offered by Chas. Pfizer & Co. It contains terramycin and is called Bi-Con TM-5. Two pounds are added to each ton of feed. Pfizer tests showed growth increase of 15% in market-weight broilers and 10% in swine.

▶ Denser, stronger, and more uniform concrete blocks and bricks are made by adding small amounts of Santomerse S, a liquid wetting agent made by Monsanto Chemical Co. It permits use of less water, thereby producing "dry" concrete of greater strength.—Chem Eng, Jan, p162, 164

FINGERS LIFT THREE CRATES

Lift trucks at A. O. Smith Corp. now have special attachments to lift as many as three crates at a time without pallets. Attachment, developed by A. O. Smith Corp., has 12 fingers on a horizontal shaft held in position by light coil springs. A vertical apron below the shaft serves as a rest. When the attachment is pushed up against a crate—or crates—some fingers are pushed back by the slats, some engage the cleats. Here is a typical application: At the end of the production line the truck picks off six crates, three at a time, and places them on a dolly. Then the truck takes two or three more crates on the finger-lift, hooks onto the dolly, transports them to storage.—Factory, Feb, p98

Keep Loom in Good Condition

Burlington Mills Corp. has adopted this preventive - maintenance program for keeping looms in good operating condition.

The loom is cleaned as soon as the warp is taken out. At the same time, the section fixer checks the condition of all parts and mechanisms. If any parts show excessive wear, they are replaced. Adjustments necessary are also made. The fixer lubricates certain parts of the loom at this time on a regular schedule.

After the loom is cleaned and lubricated, and its mechanical condition approved, the fixer puts in the new warp and starts the loom.

As he is starting it, the fixer checks the running condition of the loom—the operation of the dobby head and box motion, the reed alignment, the transfer motion, the stop motions, and the boxing of the shuttle.—Textile World, Feb, p122

Biscuit Package Unique

English-made biscuits are competing in U. S. supermarkets and chain stores. They are packaged in a newly devised wrap that eliminates the usual cardboard closure.

The package consists of a paper liner next to the biscuits, then a grease-proof corrugated fiberboard, waxed paper, and a fiber outer seal. The manufacturer, Scribbans-Kemp, Ltd., states that the biscuits will remain fresh for periods longer than 6 months.—Food Ind, Feb, p162

Spinning Neutral Shapes Aids Drop-Hammer Forming

Multiple staging dies in drop-hammer operations are expensive, especially in short-run production where several dies have to be amortized over relatively few parts. So at Douglas Aircraft Co., sheet metal is spun into neutral shapes to eliminate staging.

These neutral shapes, which approach the shape of the finished part, are readily formed to final shape in one drop-hammer operation. The prespinning has other advantages also. Metal thickness and distribution can be controlled to minimize excessive local thinning and rupture during final hammer forming.

Another advantage is that many parts can be formed in whole that formerly had to be hammer-formed in sections and then welded or riveted together. The breakdown and metal distribution permit parts to be formed that previously could not be completely hammer-formed regardless of the number of staging dies.

Controlling the metal thickness also reduces shrinkage wrinkles. So less planishing is needed after forming than with parts completely formed by hammer.—Steel, Jan 22, p72

Oil-Well Corrosion Test

Increasing use of 5% and 9% nickel steel in tubing for condensate oil wells led Sun Oil Co. to investigate the possibility of damage to the carbon-steel casing by galvanic corrosion.

The laboratory apparatus simulated conditions in a well in which the annular space between tubing and casing was filled with drilling fluids or salt water. A d-c. amplifier was coupled to a recording milliammeter and a potentiometer. Electrodes were brazed to both tubing and casing.

In the 90-day test, current flow was initially 9 ma. It then dropped to zero in 24 hr. after the dissolved oxygen was consumed. Visual inspection of the casing at the end of the test showed no signs of corrosion.—Oil & Gas J, Jan 18, p82

Steam Coils Heat Bake Oven

Need for a fireproof baking oven in a motor-repair shop led to development of a unit heated with steam coils. Steam is furnished by a boiler equipped with three 10-kw. immersion heaters.

Oven temperature depends on steam pressure, which in turn depends on number of immersion heaters in use and their operating cycle. Two heaters can keep steam at 65 psi. and oven temperature at 275° F.

Chief advantage of the new oven is that it allows a more volatile thinner to be used in the varnish and thereby speeds up the baking cycle. The more volatile thinner introduced the hazard of an oven fire starting from a spark igniting the oven gasses. So gas-fired unit and strip heaters were considered too dangerous.—Elec C&M, Jan, p56

HERE'S A HOT TIP . . .

. . . to prevent a hot coal pile. Make a thermocouple check every week and record temperature readings. Any hot spot can be noted quickly. The pile itself should be kept shallow and well packed.—Power, Feb, p98

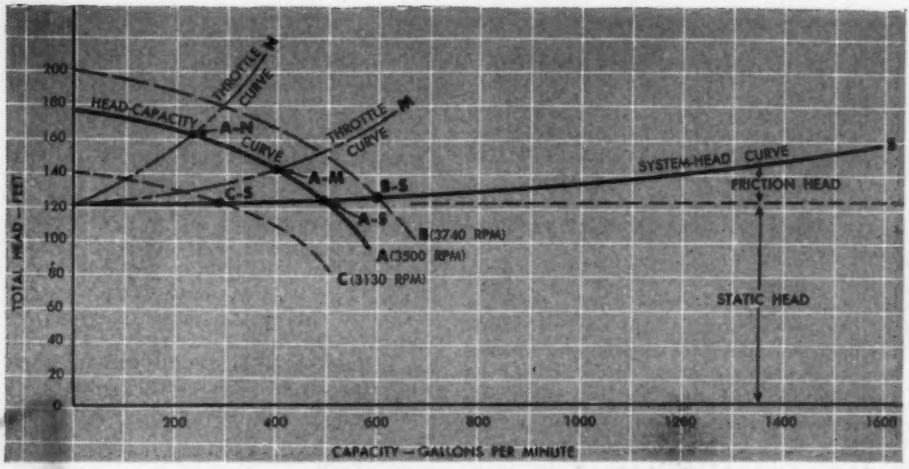


FIG. 1—System-head curve with single-pump application

Choose Pumps to Fit the Load

When you use a system-head curve to pick a pump, you will save on power and pump life and you will get more output for your money

THE OBJECT of a system-head curve is to make sure your pumping equipment matches the load and is giving you the capacity you want at the highest possible efficiency.

Here is what it looks like. Coordinates of the curve are head (ft.) and capacity (gpm.) (See Fig. 1). The head-capacity characteristics of the *piping system* is plotted on these axes. The result is similar to curve S. This curve shows the pressure required to push any given quantity of fluid through the piping layout.

How is the curve developed? Let us take a simple example, that of a pump sucking water from a well and delivering it to a higher elevation.

Static suction and discharge heads can be obtained by actual measurement. To these static lifts add the friction head at various capacities. After computing pipe friction losses, compute the losses through all fittings. Add the variable friction head to the constant static head for various capacities and you have the system head curve S in Fig. 1.

After the system-head curve is developed, plot on the same graph the pump head-capacity curve A. The point where the two curves A and S intersect (A-S) is the point at which the pump will operate most efficiently—and at that point only.

These facts remain true only if the static head and the demand for water remain constant. Changing conditions change the basic system-head curve. Variations in capacity requirements change the operating point. It is here that the system-head curve proves its value.

Pump capacity can be regulated in four ways:

1. Throttling a valve on the discharge side will cut down on pump capacity.

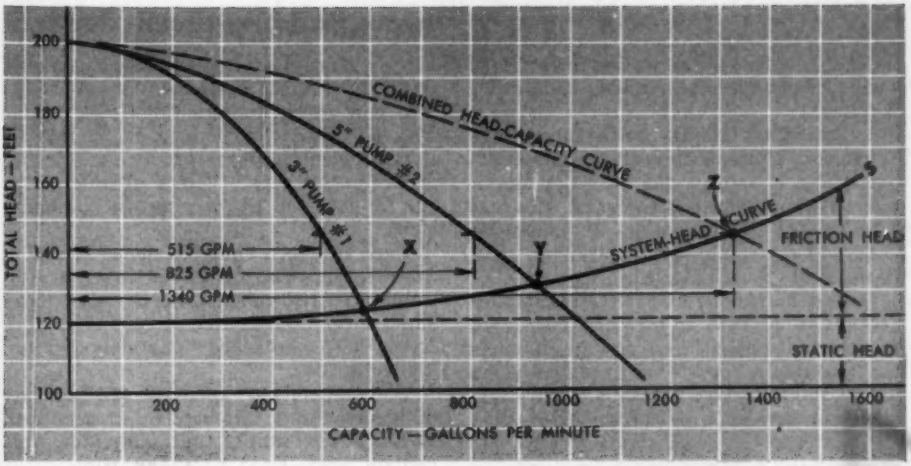


FIG. 2—System-head curve with parallel-pump application

This increases the friction head and creates a new and steeper system curve. Such is curve M in Fig. 1 for a mild throttle, and curve N for a severe throttle. The operating point moves back on the pump curve A (which has not changed) from A-S to A-M or A-N.

Regulation by throttling is not too efficient. A pump that has a relatively flat head-capacity curve would be more efficient. Factors in favor of valve regulation are low cost, flexibility, and ease of control.

2. Changing pump speed will regulate the pump capacity. It has the effect of raising or lowering the pump head-capacity curve parallel to the old curve, as shown by curves B and C in Figure 1. The system-head curve remains the same. Capacity is cut from 490 gpm. (A-S) to 310 gpm (C-S), or it is raised to 610 gpm. (B-S).

This method of regulation calls for a pump with maximum efficiency at the normal demand point.

3. Plants having wide variations in capacity requirements can regulate capacity by parallel operation. This method employs two or more pumps usually designed for different capacities along the system-head curve. When the demand exceeds the capacity of the largest pump, various combinations of pumps are operated in parallel, discharging into a common header.

Pump capacities are not added when they are operated in parallel. Look at the curves of a typical parallel operation, Fig. 2.

Pump No. 1, when operating singly, will deliver 610 gpm. at 124 ft. head (X); efficiency is 78%. Pump No. 2, when operating singly, will deliver 950 gpm. at 130 ft. head (Y); efficiency is 80%. When pumps are operating together, the combined capacity is not 1,560 gpm. (950 + 610), but 1,340 gpm. (Z). The rule is that for a given head the combined capacity of pumps in parallel is equal to the sum of the individual capacities at that head.

The combined head-capacity curve in Fig. 2 is the sum of head-capacity curves of pumps No. 1 and 2. But the operating point is where this combined curve intersects the system-head curve (Z).

For every pump added to this parallel system, the combined capacity will oper-

ate at a higher head, hence at a lower capacity for each pump. Therefore, in this type of operation, pumps with fairly steep head-capacity curves should be specified.

4. Industrial plants with long-range expansion plans frequently regulate capacity by changing the impeller diameter. This method has the same effect as varying the pump speed. It raises or lowers the pump-head-capacity curve parallel to the old curve.

One disadvantage of this method of regulation is that it is often necessary to select a pump large enough to meet the maximum conditions expected years ahead. Sometimes a new pump is a wiser choice economically.—Factory, Feb, p118

Gas-Filled Transformers Operate at "H" Temperatures

Sealed dry-type transformers using class B insulation and operating in nitrogen atmosphere have recently been announced by General Electric Co. They can operate at temperatures previously considered practical only with the more expensive class H insulation and at no loss in life expectancy.

The less expensive sealed transformers should be particularly useful in such locations as:

1. Metropolitan a-c. secondary network systems.

2. Where complete absence of liquid is desirable.

3. Industrial installations with corrosive or highly contaminated atmosphere.

4. Indoor or outdoor load-center unit substations to supply auxiliary power in large steam generating stations.

5. Mining or other underground service where there may be excessive moisture.

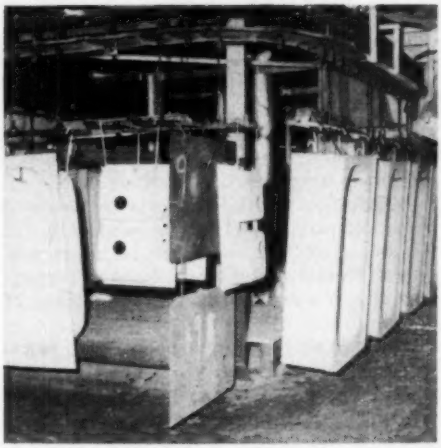
The new transformers are available in ratings 300 through 1,500 kva., 15,000 volts and below. Tanks are hermetically sealed.—Elec World, Feb 12, p112

Army Building-Block Radio

Faster, more flexible communications will be brought to the battlefield by new radio sets now in production for U. S. Army. The new sets, when connected together in various combinations, produce a variety of completed sets. Thirty different sets can be obtained by varying the combinations.

Each set has a range of about 15 miles, but two sets can be linked together for automatic retransmission of voice messages over longer distances. The sets have been designed particularly for vehicular use.

One assembled radio would consist of receiver unit, two receiver-transmitter units, power supply unit, amplifier, and control box.—Prod Eng, Jan, p156



SAFETY HOOK ENDS WRECKS

Enameling bathtubs at Norris Stamping & Mfg. Co. has been made safer by a safety hook having one end hooked over the conveyor hanger and the other—a "T"—inserted through tub's drain hole. If tub becomes dislodged from its hanger while passing through furnace, it is dragged from furnace, thereby avoiding jams in burning zone. Note also that former dead chain space at baffles now is used for burning of three double-sump sinks, thereby raising enameling capacity.—Ceramic Ind, Feb, p43

Free-Piston Air Compressors Offer Practical Advantages

During the past few years, France has made great progress in developing free-piston air compressors; commercial applications are constantly increasing.

The free-piston compressor consists of a central two-cycle diesel cylinder with opposed pistons and a combustion space between them. One piston is in the air-compressor cylinder, the other in a "cushion" cylinder. Burning fuel causes pistons to move outward, thereby compressing air and discharging it from one cylinder. Energy stored by compressing air in the "bounce" cylinder returns pistons to the center.

Portable free-piston units, built by Societe Industrielle General de Mecanique Appliquee (SIGMA), is rated at 194 cfm. Discharge pressure is 85 psi. The unit weighs 4,620 lb. A smaller unit of similar design is rated at 130 cfm.

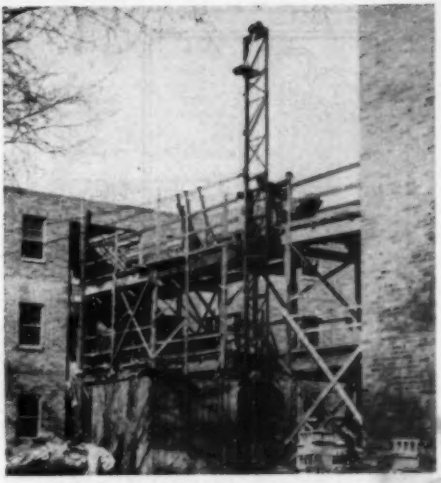
A two-stage stationary unit built by SIGMA is rated at 630 cfm. at 100 psi. Its speed is 525 cycles per min.

Advantages of the free-piston design include freedom from vibration, relatively low weight and bulk, immediate starting, and notable fuel economy with no unloading losses.—Power, Feb, p84

Aluminum Pulleys Replaced

Savings in machining costs were possible when laminated phenolic was substituted for aluminum in making drill-press step pulleys. High Speed Hammer Co., Inc., adapted its machining setup to handle specially formed pulley blanks of macerated, fabric-base plastic supplied by Synthane Corp.

A tool with four cutting edges makes four pulley grooves in one operation with a single setting. Two machining operations are required for finishing the plastic blanks as compared with seven for the aluminum pulleys.—Mod Plastics, Jan, p137



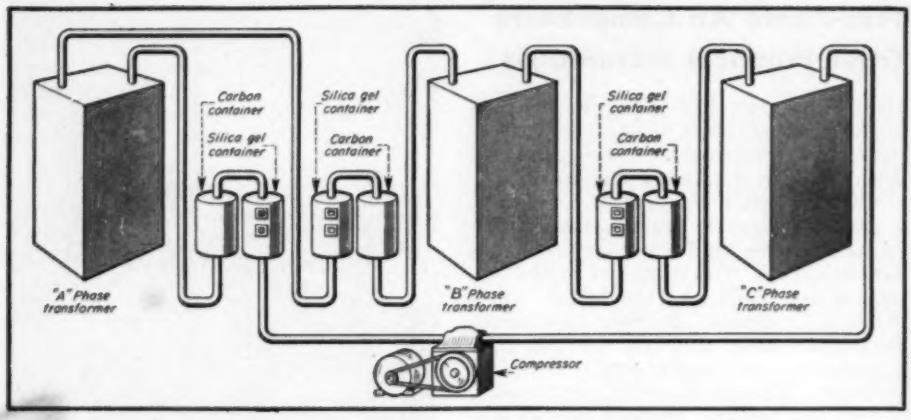
SERVES TWO BUILDINGS

Single portable material elevator serves two buildings at once on an apartment construction project. Contractor, Alexander & Kingbay, erected a two-level timber scaffold bridge between pairs of buildings. The elevator is near the center of the scaffold and supplies both floors of both apartments from this one setup.—Const Meth & Equip, Feb, p40

Top-Mounted Rear Drive Unit

New heavy-duty, two-speed, hypoid-helical double-reduction rear axle solves the drive line problem of short-wheelbase truck tractors. Arrangement of internal gearing allows top mounting of the final drive unit instead of the conventional front mounting.

The top-mounting feature, according to the manufacturer, Timken-Detroit Axle Co., provides a reduction in the dimension from the centerline of the axle to the input end of the hypoid pinion. Thus for short wheelbase tractors a longer propeller shaft can be used. Increased height of the drive pin, because of top mounting, serves to straighten out the drive line and aids in the elimination of angles in mounting the engine and transmission unit.—Auto Ind, Feb 1, p41



GAS CIRCULATION DRIES TRANSFORMER INSULATION

Gas-circulation method, developed by Philadelphia Electric Co., dries out transformer insulation while the equipment is in use. Nitrogen is circulated by compressor through closed-loop system that connects the space over oil with water and oil-vapor absorbants —silica gel and carbon. Advantages: transformer kept in service, no loss of revenue, no expensive oven to build, no interference with or change in operating procedures, applicable to one or more units by series piping. Method can be applied to any transformer that can hold a pressure of a few inches of mercury and that has a 3-in. or larger gas space above oil.—Elec World, Feb 12, p98

Drawing Press Stretched for Forming Fuel Tanks

In building 300-gal. jettisonable wing-tip fuel tanks, Lockheed Aircraft Corp. engineers decided that two half shells would be the best design. Each shell was designed to be 16½ ft. long.

But this length was 2½ ft. longer than the largest drawing press available, a 1,500-ton Clearing. So outriggers were built on both ends of the press to accommodate a die and hold-downs of the required length.

The outriggers, extending 32 in. beyond each end of the 14-ft. press platen, carried five pressure pins to control clamping forces at the extreme ends of the draw rings. Under full load, outrigger deflection proved to be less than 0.015 in. The hold-downs were cast of Kirksite and made 8 in. thick to minimize warpage and deflection.

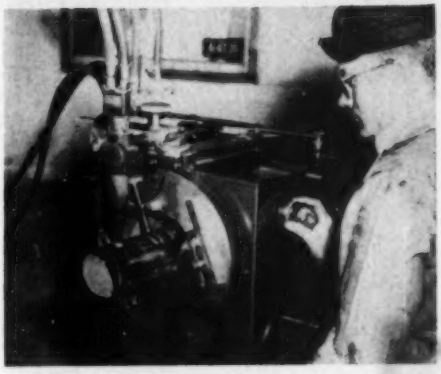
Shells were drawn of 61 S aluminum-alloy sheet. Best results were obtained by partially forming the shell in the annealed condition, heat-treating it, and finish-forming as soon as possible.—Weld Eng, Feb, p20

New Poison-Ivy Remedy

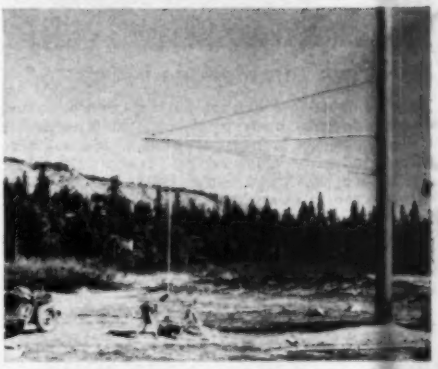
Utility line workers and others engaged in outside work will be interested in a new remedy for poison ivy. Called TAM by its manufacturer, Titanium Alloy Mfg. Div. of National Lead Co., the remedy relieves 90% of poison-ivy cases.

TAM is based on zirconium carbonate, which neutralizes urushiol, the irritant in poison ivy. TAM is also helpful for athlete's foot and industrial dermatitis. The cashew-nut oil-extraction industry, long troubled with workers' skin complaints, is finding it useful. Still another promising use is as an anti-perspirant.—Chem Ind Wk, Jan 27, p43

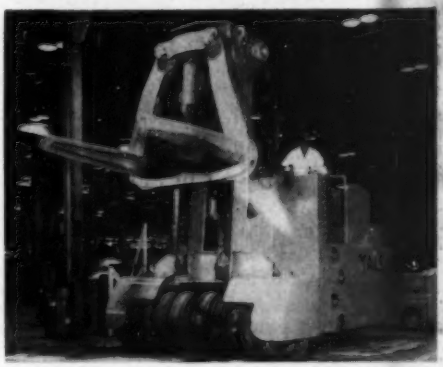
This Month's How To . . .



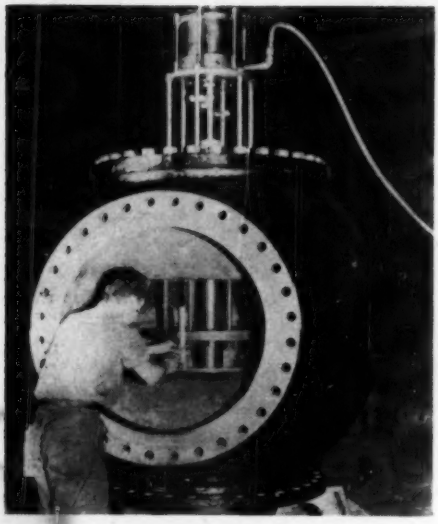
. . . **cut tubular materials** is made easy with this flame cutter designed by the Heath Engineering Co. Tubing is placed in a hollow spindle that extends through the machine's cabinet. The cutting operation requires two simultaneous movements: (1) the tube rotates in the spindle at variable speeds; and (2) a moving cam, at right angles to the tube, pushes a slide that controls the position of the torch. Contours of the cam are specially shaped for each type of cutting operation. When cut, the tubing is ready for welding or other fabrication.—Business Wk, Feb 3, p73



. . . **measure snowfall** in isolated mountain areas is made a lot easier by a thickness gage developed by engineers of U. S. Weather Bureau and the U. S. Army Corps of Engineers and manufactured by Motorola, Inc. The gage has a Geiger tube suspended from a horizontal arm and a radiation source of cobalt-60 buried in the ground directly under the tube. Output of counter tube, which decreases as snow depth increases, is transmitted to a central collecting station by one-way f-m. radio transmitter and repeater stations controlled by time clocks.—Electronics, Feb, p88



. . . **speed materials handling** in steel mills is answered by this giant lift truck built by Yale & Towne Mfg. Co. It can lift 80,000 lb. and carry one 80,000-lb. coil of steel or two 40,000-lb. coils around strip mills. The two rams open and close like a pair of scissors. The truck, which weighs 84,000 lb., is powered by a diesel-electric unit of the same size used in a 25-ton locomotive. Articulated construction allows operation on uneven floors. High capacity of the truck will reduce handling time as coil size can be doubled. Quality and yield will improve.—Steel, Jan 29, p31



ROLLER-BEARING VALVE

This 36-in. angle double-ported control valve, one of several built by Kieley & Mueller, is claimed to be largest of kind made. Valve has to open or close within 1 sec. So guide posts are equipped with roller bearings to allow free-friction movement of plugs between open and closed positions. Valves are now installed in large tonnage oxygen plant.—Chem Eng, Feb, p161

New-Type Catalytic Cracker

First commercial units of a new catalytic cracking method have been installed at Magnolia Petroleum Co.'s Beaumont, Texas, refinery. The equipment, known as modified, air-lift Thermofor catalytic cracking units, will produce high-quality gasoline. Each unit has a capacity of 15,000 bbl. per day.

The units transfer the catalyst by air lift instead of bucket elevators. Another feature is that heavy, nonvaporized feed stocks can be charged.

Advantages of the new units are high levels of liquid recovery, catalyst activity, cracking efficiency, and gasoline-to-coke ratio.—Oil & Gas J, Jan 25, p168

Construction Methods and Trends Around the World

Aid to foreign roadbuilders—Here is what the U. S. Public Roads Bureau has done to meet demands from abroad for information and assistance in road building. It supplies literature on all phases of highway development. It receives individuals and groups from other countries, discussing problems with them, giving courses of instruction, and arranging field studies. The bureau also participates in international conferences. —Eng News-Rec, Jan 1, p51

Point 4 aid for Ceylonese projects—Major program on which U. S. engineers are assisting is the planning for the rehabilitation or rebuilding of extensive ancient irrigation works. Another program is the Gal Oya Dam and power plant. This is a Ceylonese government project being built in the heart of the jungle. Modern tractors helped build 30 miles of road through jungle to the site. When the dam is finished, its works will impound water to irrigate approximately 100,000 acres. The 10,000-kw. power plant will be capable of providing energy for a big development in the sugar-cane industry.—Eng News-Rec, Feb 1, p59

To develop Liberia—The U. S. and the Republic of Liberia have concluded a general Point 4 agreement for cooperative economic development of that country. Liberia has asked for U. S. assistance in carrying out a new long-range development program, the Liberian government to contribute 20% of its total national revenue toward the cost. Technical Cooperation Administration announced that the U. S. will contribute the services of 67 technicians, plus needed equipment. It will take 5–10 years and cost about $32.5-million. Program will concentrate on roads, bridges, hydroelectric power and water works, agricultural development, health projects, education and public administration.—Eng News-Rec, Feb 15, p68

Drills 65 Rockwell C Steel with Carbide Twist Drill

Special drills and careful methods can drill tool steel successfully up to 65 Rockwell C hardness. Tests at Westinghouse Electric Corp. prove that a carbide-tipped twist drill, similar to Whitman & Barnes' type 1400, can operate in such steel up to 180-200 sfpm.

The drill has a 130° included angle, positive rake, and 12° clearance. The high-speed-steel shank has two flutes. This type of twist drill cuts freer and requires less power than the straight, negative-rake, carbide drill recommended by many manufacturers. Also, it does not reduce hardness around the hole by annealing the metal.

The setup should be rigid, and the drill must be started carefully. The hole is spotted with a small carbide center drill and the larger drill installed without changing the setup.

Holes over ¾ in. should be drilled with a lead drill. The hole-size drill must be started slowly, and pressure increased until a good chip is built up. Power feeding is not recommended. Coolant is water or soluble oil in a heavy flow.—Am Mach, Feb 5, p125

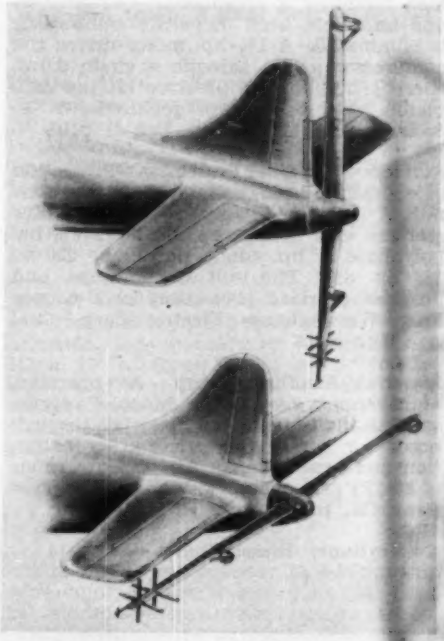
Better Overburden Drilling

A new electric rotary drilling machine working on Enos Coal Mining Co.'s strip properties sinks three times as many blast holes per shift as can be sunk with a churn drill.

The machine, built by Joy Mfg. Co., has a hydraulic drill feed through twin cylinders. Continuous rotary pressure-cutting, rather than percussion, is employed. Four feed stages are available.

Pressurized air and suction combine to remove cuttings from the hole. Air, blown down through the drill string, emerges at the bottom of the hole through three jets inside the bit. This blast serves three purposes: (1) it cools the bit; (2) it forces fine cuttings from between the bit and the wall of the hole; (3) it blows rock chips out of the path of the bit so that they do not have to be ground up.

Suction for removing cuttings from the hole is provided by an American Air Filter Co. Rotoclone. The suction draws the cuttings up to the collar of the hole. There, a rubber hose carries cuttings into the Rotoclone. The Rotoclone traps the cuttings and exhausts cleaned air through a stack.—Coal Age, Feb, p112



STRATOVISION AIRPLANE ANTENNA

In rebroadcasting radio or television programs from an airplane, transmitting antenna must be spaced away from major structural parts of airplane to prevent interference. So at Glenn L. Martin Co., this antenna was developed. Rotating the mast to vertical position during flight supports antenna below the airplane. Mast is rotated to horizontal position for landing.—Electronics, Feb, p196

New Products

Foundry Shakeouts — General-purpose shakeouts with capacities of 2,000-5,000 lb. have drive shafts extending from one side, thus requiring only one dust seal. Units have baffle plates for diverting sand toward center of collecting hopper. They can be installed with horizontal or sloped deck.—**Allis-Chalmers Mfg. Co.**—Foundry, Feb, p217

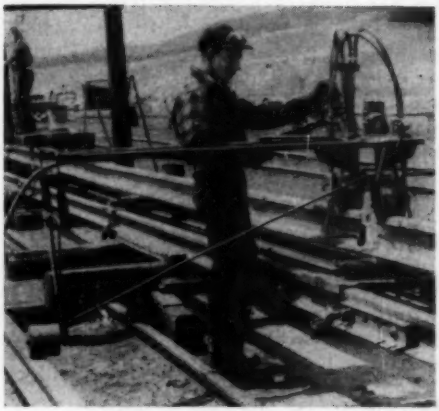
Electropneumatic Hammer—Drill-hammer combines a compressor and drill in one handheld unit. Separate compressor is eliminated. A 1½-hp. motor drives the compressor piston through a chain drive, thereby building up pressure on the drill piston. No valves are required.—**O. F. Sparano**—Eng News-Rec, Feb 1, p101

Starters Offer Dual Protection—Protection of operating personnel as well as the connected machine is stressed in new motor starters with ratings up to 600 v., 7½ hp. polyphase, 5 hp. single phase; or 220 v., 1½ hp. dc. The unit starts, stops, and provides overload protection for d-c. motors.—**Westinghouse Electric Corp.**—Coal Age, Feb, p128

Materials-handling Pump — Air-operated, high-volume pump, the Mogul-Powerflo, supplies industrial spray materials through hoses for spray-gun, pole-gun or extrusion-gun applications. Air pressure range is 20-175 psi. Pump weighs only 35 lb.—**Gray Co., Inc.**—Power, Feb, p144

Two-cylinder Diesel Engine—Extra-heavy duty engine is rated at 20-30 hp. within 1,200-1800 rpm. It is a vertical, four-cycle, mechanical injection engine suitable for heavy-duty, small power requirements.—**Nordberg Mfg. Co.**—Marine Eng & Ship Rev, Feb, p100

Liquefies Frozen Foods — Stainless-steel centrifugal liquefier liquefies frozen ingredients before use in food processing by rapidly revolving steam-heated disk. For example, 50% frozen cream can be liquefied at 5,000 lb. per hr. From 10-20 boiler hp. are required for operation.—**Bryant Machinery Co.**—Food Ind, Jan, p92



FLAME-CLEANS RR RAIL

Oxyacetylene flame cleaner, made by Union Carbide & Carbon Corp., cleaned every inch of the 12.6 miles of welded rail going into the Denver & Rio Grande Western RR Moffatt Tunnel. Flame removed moisture, scale, and dirt; then rust-inhibiting paint was applied to the still warm rail.—Steel, Jan 29, p66

Electric Pallet Truck—Pallet loads up to 4,000 lb. are easily handled by this truck. Features include a new contactor panel, positive-action brake with dead-man control, improved differential action, and all-rubber, dual trailer wheels.—**Towmotor Corp.**—Auto Ind, Feb 1, p62

Prevents Fires—Fuse coupling is claimed to eliminate fire hazard in homes from damaged appliance cords. Built-in fuse breaks circuit as soon as a short occurs in connected lamp or other cord.—**F. H. Smith Mfg. Co.**—Elec Merch, Feb, p150

Bin Vibrator—Features of the new vibrator include: no impact of piston on either end, no metal-to-metal pounding, no springs, no ear-splitting noises. Device has heavier pistons and longer stroke than heavy-duty impact-type vibrators.—**Cannon Vibrator Co.**—Eng & Min J, Feb, p148

Synchronous Generators—Types ATI, ASI, and ATB generators have frequency ratings of 60 and 400 c. Basic 60-c. design operates with standard voltage regulator in exciter field circuit with 64-v. excitation. Rating: 2 to 45 kw. The 400-c. generator is rated at 2 kw. single phase to 40 kw. three phase at 3,428 rpm.—**General Electric Co.**—Oper Eng, Feb, p77

Winder-redraw Machine—Nearly automatic operation of this machine is claimed. It has a self-threading tension, self-opening spindleless attachment, and full-spool stop motion. All threading operations are eliminated. Full stop motion prevents overrunning of full bobbins.—**Sipp-Eastwood Corp.**—Textile World, Feb, p164

Packaged Trolley Conveyor—Overhead trolley conveyor can be put together and taken apart in any desired layout. One small motor drives several hundred feet of continuous belt. Packaged sections can be adapted to bench and portable conveyor systems.—**Lightweight Conveyor Co.**—Factory, Jan, p147

Machine Finds Data—Card-filing system, called Conve-filer, helps get the card wanted. It consists of a desk-cabinet combination, with two power-driven chains inside to which card-filing trays are attached. The chains, driven by an electric motor, will bring any desired card to the operator. A pedal controls the operation.—**Remington Rand Inc.**—Business Wk, Jan 27, p80

Nylon in Rubber—New diaphragm of molded synthetic rubber strengthened with nylon fabric will improve gas-pressure control with high-pressure regulators and increase period of trouble-free service. Diaphragms also are easier to assemble in regulators.—**Rockwell Mfg. Co.**—Oil & Gas J, Jan 4, p78

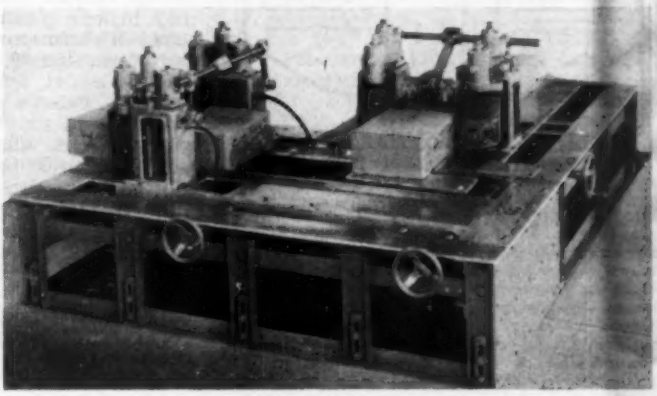
Radiant-heat Baseboard—Electriglas baseboard panels are designed for prime or supplemental heating in homes or in industrial or commercial buildings. Unit is chemically treated glass panel encased in steel frame. Panel reaches 240° F. Two capacities are 683 Btu. and 1,024 Btu.—**Appleman Glass Works**—Elec C&M, Jan, p90

Plates Hard Chromium—Model A-20 Chromaster chromium-plates parts up to 10 in. square. Hard chrome can be controlled to tolerances of less than 0.0001 in. Unit is powered by selenium rectifier and is complete with tank, rheostat, timer, ammeter, and reversing switch.—**Ward Leonard Electric Co.**—Iron Age, Jan 25, p38

Aerosol Insecticide—Knox Out is a mist spray of DDT, pyrethrum, and piperonyl butoxide. It is intended for household use. Room 10 ft. square should be sprayed for 5 sec. and then closed for 15 min. Spray can be used outdoors for temporary elimination of insects.—**Pennsylvania Salt Mfg. Co.**—Chem Eng, Feb, p186

NOVEL MACHINE PRINTS CASES

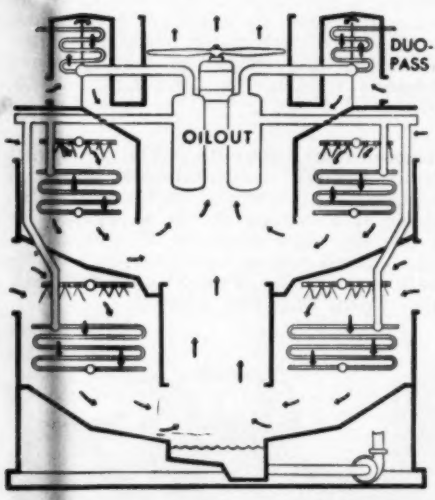
New four-header case printer, developed by Adolph Gottscho, Inc., automatically prints the four panels of each packed case. Machine carries cases by chain conveyor to first station where side panels are printed. Cases travel to L-shaped transfer point where plate positions them on another conveyor for travel between end printing dies. — Food Ind, Feb, p117



New Products (Cont.)

Adjustable Stop Gage—Designed to put power cut-off sawing on a mass production basis, Comet adjustable stop gage can be used with any saw. It permits several pre-determined lengths to be set at one time and accurate cuts to be made as rapidly as the saw can be pulled through work.—**Consolidated Machinery and Supply Co.**—Am Builder, Feb, p156

Welds 1½-in. Aluminum—New hand torch and automatic wire-feed unit for argon metal-arc welding can weld aluminum from ⅛-1½ in. thick. Consumable electrode serves as filler metal. Feed rate is 30-380 ipm. Several copper alloys and stainless steel also can be welded with this equipment.—**Linde Air Products Co.**—Weld Eng, Feb, p44



CONDENSES REFRIGERANT

High-capacity unit for large refrigerating plants has 300-ton rating. Refrigerant gas pass through precooling coils at top that remove superheat and reduce gas temperature close to condensing point. Coils also condense entrained oil vapors, which are removed by Oilout separators. Gas then passes to condensing coils where it condenses by evaporation of water spray. Maker is Niagara Blower Co.—Power, Jan, p144

Heavy-duty Lathes—Engine lathes, ranging from 40-80 in., have 56 feeds and are powered by either a-c. or d-c. motors. A 1½-hp. motor on apron permits longitudinal traverse without danger of rapidly revolving leadscrew. Lubrication is automatic.—**Niles Tool Works Co. Div., Baldwin-Lima-Hamilton Corp.**—Am Mach, Feb 5, p180

Flattens Bags — Power-driven machine flattens filled bags by passing them between two conveyors that apply a kneading and pressing action. Discharge section is raised hydraulically to follow tier height as bags are piled on pallets.—**Flexoveyer Mfg. Co.**—Food Ind, Feb, p151

Electric Car Kilns—Models C41 and C64 car-type periodic kilns are for ceramic firing not in excess of 1500° F. They have two stainless-steel cars with 18 stainless-steel bats. Kilns are heated by wire-wound radiant heaters.—**Ceram-Kiln Co.**—Ceramic Ind, Jan, p180

Softens Water—Automatic softener has a by-pass permitting water to be drawn at any outlet during regeneration. A remote-control device operates the regeneration cycle from anywhere in the house.—**The F. E. Myers & Bro. Co.**—Hardware Age, Feb 8, p116

Rainbow Resins—New transparent, colored varnish resins, based on metal resinates, are in pilot-plant production. They are available in red, blue, yellow, green, orange, brown, black, and purple. Uses may include plastics, lacquers, varnishes, inks.—**Michelman Chemicals, Inc.**—Chem Ind Week, Jan 20, p25

Modern Potter's Wheel—New potter's wheel has six demountable flywheel weights that allow variation in kick weights from 60-180 lb. Unit also has removable drip pan and adjustable seat.—**T. A. Randall**—Ceramic Ind, Feb, p90

Guillotine Cutter—Model 4-M-48 cutter can be used on paperboard, plastics, or rubber. It can cut sheet or slab stock up to 48 in. wide and 1¾ in. thick. A 4-hp. motor drives flywheel, which drives main shaft to operate knife carriage.—**Black Rock Mfg. Co.**—Paper Ind, Jan, p1112

AIRBORNE CRAWLER TRACTOR

You cannot buy this tractor, but it may give you some ideas. Developed as lightweight airborne equipment for U. S. Army, it has newly designed hydraulically operated blade that utilizes entire tractor weight. Another idea is use of reversed scarifier teeth on bottom of blade. These teeth scarify ground when tractor backs up, thus making next cut easier and faster. Result: 35% increase in production.—Prod Eng, Feb, p152

Steam Sprays Paint—Heavier coats of paint without sagging or running are possible with paint spraying equipment operated by superheated steam of 100 psi. or more. Maker claims that paint saving of 10-20% results from reduction of overspray and atomization losses.—**American Brake Shoe Co.**—Steel, Feb 5, p148

Tiny Relays—Designed to meet exacting space and performance requirements in airborne equipment, these relays weigh less than ½ oz. and are smaller than a postage stamp. They are built to withstand high vibration and acceleration forces.—**Neomatic, Inc.**—Aviation Wk, Jan 15, p52

Lightweight Diaphragm Pump—Intended primarily for seepage control and ditch work, pump will lift from levels 25 ft. below pump and handle liquids almost heavy enough to shovel. Two models are available; one has capacity of 2,100 gph., other will handle 3,200 gph.—**Marlow Pumps**—Const Meth & Equip, Feb, p112

Heavy-duty Bandsaw—Machine is capable of production cutting of heavy and bulky materials. Table feeding stroke of the saw is 36 in., with 200-lb. pressure available. Feed pressure is automatically controlled by resistance of work. Variable drive has a tool speed range of 40 to 10,000 fpm.—**DoAll Co.**—Mod Plastics, Feb, p136

Brake-lining Adjuster—Automatic adjuster compensates for lining wear of cam-actuated air brakes by taking up slack automatically. As lining wears, a gear connected to push rod from air-brake diaphragm slips from tooth to tooth of ratchet taking up slack.—**Brakemaster Corp.**—Fleet Owner, Jan, p69

Air-line Safety Device—Low-pressure warning device whistles a shrill alarm when the pressure in any compressed-air systems falls below the minimum operating pressure. Valve element opens when pressure falls below pre-selected value. Escaping air blows whistle.—**Airlarm Co.**—Ind Dist, Feb, p118

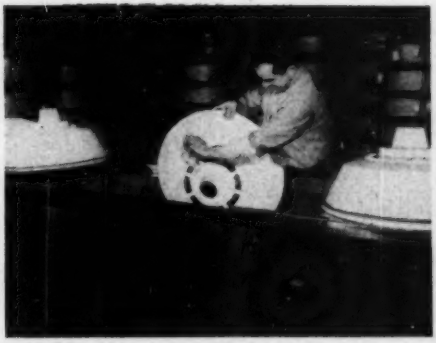
Surface Grinder—Model 16A3 rotary-table grinder has three horizontal abrasive wheels, which can all be set to grind the same height or different heights at different distances from center of chuck. It can be equipped with 40-in. dia. magnetic chuck.—**Blanchard Machine Co.**—Am Mach, Jan 8, p140

Mercury Rectifier—NL-643 tube for heavy-duty industrial applications is filled with mercury vapor, is rated at 15 amp., and has peak inverse voltage rating of 700 v. Filament heating time is only 120 sec. Maximum peak current is 90 amp.—**National Electronics, Inc.**—Electronics, Feb, p128

READER SERVICE

As a special service to our subscribers, McGraw-Hill Digest will furnish without any charge additional information about any new product or technical development described. Address your letter to: The Editor, the McGraw-Hill Digest, 330 West 42nd St., New York 18, N. Y., U. S. A. —*THE EDITORS*

FLUORESCENT LUMINAIRES of four 40-watt lamps on 12½-ft. centers provide 45 ft.-c.



INCANDESCENT FIXTURES are washed in two-compartment tank—detergent and water.

Planned Lighting Maintenance

Program of planned maintenance of Westinghouse lighting system keeps illumination levels high at cost only of the power saved

NO ONE BELIEVES any longer that plant lighting needs little or no maintenance. But far too many plants pay far too little attention to this important task.

Here is what happened at one plant when maintenance was neglected. For many years, practice at the Westinghouse Electric Corp. Pittsburgh plants was to clean all luminaires and replace burned-out lamps at least once every 4 months. But in the early 1930's, this practice was dropped to cut costs.

In 1936 a survey revealed that lighting levels in these plants had decreased 65% because of the lack of maintenance. Analysis of the system revealed that the cost of power being lost would more than equal the cost of proper maintenance.

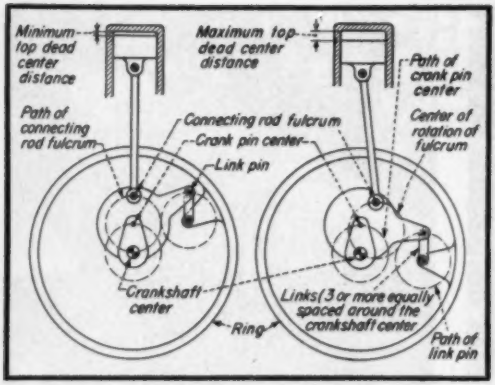
The planned-maintenance program now in effect has reverted to the 4-month cleaning cycle. Cleaning periods are staggered for different sections.

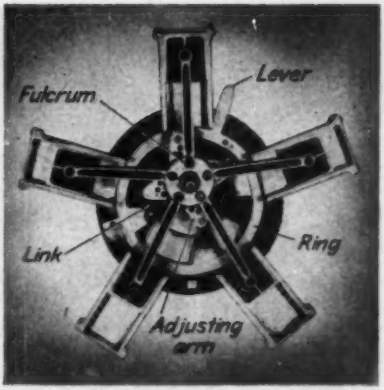
A wide variety of lighting systems, luminaires, and light sources are involved in this maintenance program. Practically all office lighting is fluorescent with ceiling-mounted luminaires of the egg-crate louver, four-lamp type. These fixtures are easy to reach from stepladders.

Production areas are lighted according to their height. Low-bay areas are lighted with either fluorescent or incandescent luminaires, again easy to reach from stepladders. Medium-bay areas are lighted with incandescent or mercury-vapor luminaires or combination incandescent-mercury vapor units; these units can be reached by extension ladder or from the top of bridge cranes.

High-bay areas are lighted with incandescent luminaires or combination units. Where fixtures are too high to be reached from the catwalk of bridge cranes, permanent platforms in some cases are mounted on the crane trolleys. All high-bay luminaires are equipped with safe-change hangers so the entire unit can be removed for maintenance. Units are lowered to the floor for cleaning and for changing lamps.

In fluorescent-light maintenance, two major problems exist. First is flickering in the tubes. This disturbs workers and


Minimum top dead center distance
Maximum top dead center distance
Path of crank pin center
Path of connecting rod fulcrum
Connecting rod fulcrum
Crank pin center
Center of rotation of fulcrum
Link pin
Crankshaft center
Links (3 or more equally spaced around the crankshaft center
Ring
Path of link pin



MECHANICAL LINKAGE VARIES COMPRESSION RATIO

Variable-compression ratio radial engine for aircraft has no master connecting rod. The pilot through a mechanical linkage can vary travel of pistons during flight. Ring is rotated to displace fulcrums angularly around crankpin center and to force connecting rods to operate in an unsymmetrical position to lower compression ratio in cylinders. Diagrammatic view of linkage for one cylinder shows extreme settings to give maximum and minimum compression ratios. Single-link connection is shown, but the actual design includes several spaced to maintain balance. Vibration is reduced to a minimum. Owner of patents is Franklin Institute, Phila.—Prod Eng, Jan, p114

tends to burn out the ballast. It can be eliminated by using no-blink starters, which automatically cut off the offending lamp if the current is excessive.

The second problem is the cleaning of plastic louvers. If they are washed with soap and water and then dried with a cloth, they will be as dirty in 2 weeks as they should be in 4 months.

Reason is that drying plastic louvers with cloth loads them with static electricity, which causes dust to be attracted to their surfaces. So Westinghouse washes the louvers in a detergent solution, rinses them in clean water, and reinstalls them while they are still wet. —Elec C&M, Feb, p64

Speed Openhearth Charging

Openhearth charging time has been cut by 55% at Armco Steel Corp. Charges of 45,000 lb. are mechanically raised by hoist to charging level in 25 sec.

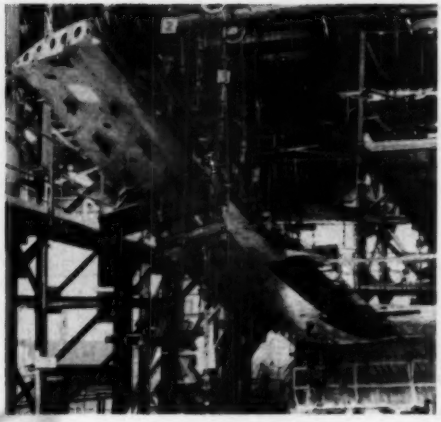
Cold charging materials are brought into the plant at ground floor level on flat cars carrying four pans each. Loaded cars are lined in front of the furnace.

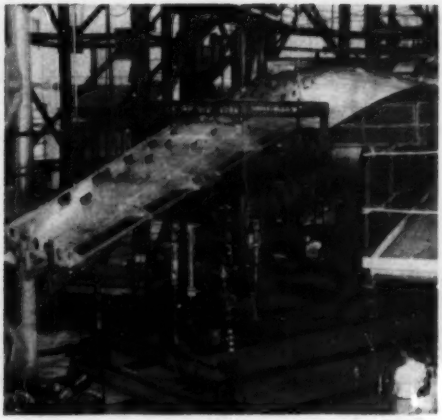
The first car is mechanically pushed onto the hoist platform, positioned by a cager, raised to charging level, and turned 90° so it can be pushed onto the rails in front of the furnace. The charging machine then charges the furnace in the conventional manner.

Empty cars and pans are pushed onto a second hoist, which lowers them to floor level. Meanwhile the first hoist receives the second car, and the cycle is repeated.

Each hoist's platform is raised by a 22-in. dia. direct-acting vertical hydraulic ram. The platform is rigidly connected to the ram, but ram and platform assembly is free to rotate for turning the charge car. A cam turns the platform as it rises.

Round-trip hoist time is 120 sec.—32 sec. for loading, 25 sec. up, 31 sec. for unloading, and 32 sec. to return to ground level.—Steel, Dec 18, p114





TORTURE TEST IS TOUGHER THAN COMBAT

Boeing Airplane Co. wanted to find out how rugged their B-47 bomber was. So Boeing engineers tested it beyond the breaking point. Towers and scaffolds were built so that up to 700,000 lb. of load could be applied to a wing designed to carry only 185,000 lb. Bent up, left, then down, right, the wings showed a total deflection of about 20 ft. before they began to break. Varying pressures were applied by means of hydraulic jacks, rivaling the worst possible conditions of storm or extreme maneuvering. Electronic gauges measured the stresses at many different points. —Business Wk, Feb 10, p96

Grain Alcohol without Malt

Lower-cost industrial alcohol from grain may be the result of replacing barley malt with fungal amylase. Recent commercial-scale tests by Grain Processing Corp. and U. S. Dept. of Agriculture indicate a saving of 3-4¢ per gal. at present price levels.

Alcohol made by this process will not compete with that produced by direct synthesis or by fermentation of black strap molasses. Nor will fungal amylase replace barley malt for whiskey production as the flavor is not the same.

Fungal amylase is an enzymatic material produced by fermenting a mixture of a culture of *aspergillus niger* NRRL 337, ground corn, and calcium carbonate in a thin stillage with a 5% solids content. The mash to feed the final alcohol fermenters is made by cooking the fungal amylase with additional ground corn and stillage.

Another barley-malt substitute is bacterial amylase. This is in the form of a dry powder and can be shipped. Fungal amylase should be made where it is to be used.—Chem Ind Wk, Feb 3, p19

Impact-Fatigue Test Machine

This instrument provides a control test of flat paper samples to predict performance of filled bags. Test impacts are applied by allowing metal balls to drop through a tube onto a rigidly held piece of paper. The number of balls required to fracture the paper is an indication of the impact-fatigue strength. Ball size depends on paper strength.

The specimen is clamped at a 15° angle with the horizontal. This permits the ball to bounce away from the paper after applying only one impact. Steel balls are dropped on the paper at the rate of one every 2 sec. until the specimen breaks.—Mod Packaging, Dec, p131

New Metals and New Methods

New methods for processing the newer metals are constantly being developed. Here is a summary of latest metallurgical techniques

A SURVEY of the developments in the metallurgical industries for 1950 uncovered many small changes. Whether these changes are improvements or temporary deviations from orthodox methods remains to be seen.

Here is a brief review of the new metals and new processing methods.

Titanium—U. S. production for 1950 is estimated at 60 tons. Demands for rearmament will mean many times that amount for 1951.

Titanium is produced commercially by the Kroll process. It is a batch process and requires high-priced starting materials.

A new process, developed by Maddex and Eastwood, injects a stream of molten magnesium into a vessel containing $TiCl_4$ vapors. The resulting reaction produces molten $MgCl_2$ carrying small particles of titanium.

Molten $MgCl_2$ plus titanium mixture is drawn from the bottom of the reactor into an arc furnace. The heat of the arc vaporizes the $MgCl_2$ and, at the same time, melts the titanium into an ingot that could be drawn off continuously from the bottom of the furnace.

Vanadium—The Electro Metallurgical Division of Union Carbide and Carbon Corp. is prepared to deliver vanadium ingots, bar, sheet, and foil. Possible applications of the metal are not known, but it has good resistance to reducing acids and salt water plus a high modulus of elasticity.

The production method is reported to reduce V_2O_5 with metallic calcium in a pressure bomb. Iodine is also added to the mixture to increase the heat evolved.

Zirconium—The U. S. Bureau of Mines plant installation for producing zirconium (McG-H Digest, Oct '50, p23) has been increased. The process to be used in the enlarged plant is the reaction of gaseous $ZrCl_4$ with magnesium followed by vacuum distillation to produce a sponge.

Zirconium ores all contain some hafnium that follows along through the reduction processes and eventually ends up in the metal. Separation of the two is not easy. Three methods have been examined on a laboratory scale. A partial separation can be made by the selective action of ion-exchange resins on a solution containing zirconium and hafnium ions.

A second method is based on the selective adsorption of hafnium on silica gel from a solution of the chlorides of the two metals dissolved in methanol.

The third method involves a fractional distillation of $3ZrCl_4$-$2POCl_3$.

Molybdenum — Possible applications are in high-temperature apparatus such as gas turbines. Trouble is encounted in obtaining molybdenum ductile enough to be formed into complex shapes, and in finding a coating or alloy that will resist oxidation.

Several companies can now deliver sintered molybdenum ingots up to 4-in. square and 4 ft. long, weighing 400 lb.

Chromium—The brittleness of chromium produced by ordinary methods is due to its oxygen content. Low-oxygen content chromium was produced in this manner: Anhydrous chromium trichloride was reduced with magnesium metal. The $MgCl_2$ and excess magnesium were removed by vacuum distillation to leave high-purity chromium metal.

This metal was further de-oxidized by heating it in a stream of dry hydrogen. The chromium thus obtained was hot malleable; that is, above 500°C. a sheet of it could be bent and cut.—Eng & Min J, Feb, p122

New Plant for Company Costs $11.50 a Square Foot

Elimination of frills, single-story design, and standardized equipment permitted the Carpenter Paper Co. to build a modern, efficient office building at the low cost of $11.50 a sq. ft.

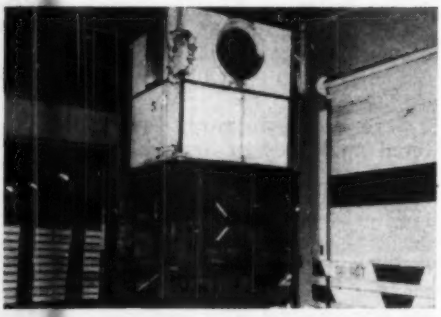
Offices are not ornate, but are functional. Walls are plastered except for the lower area, which is bleached oak.

The president's and vice-president's offices are the only ones carpeted. The others have their floors covered with asphalt tile. Ceilings are sound-proofed with inexpensive wood-fiber blocks. Illumination is from recessed fluorescent lights in private offices and suspended fluorescent lights in the general offices.

Standardization of equipment also helped keep costs down. Metal desks, chairs, and tables were kept as uniform as possible and were supplied by one company.

A table is combined with the desk in each executive office. This arrangement allows holding small meetings in any office.

Of its 35 typewriters, 27 are electric models. The company also uses punched-card equipment, duplicators, and dictating machines.—Am Business, Jan, p16



HEATERS COOL PERISHABLES

Pier in New York City has been given 1,500,000 cu. ft. of refrigerated space for perishable foods by converting heaters to coolers. Original heaters (upper white part) distributed heat from steam pipes. Fans in top section were reversed, and a bottom part was added for holding ice. Air is drawn in at top and forced down over ice and out the sides and bottom of the ice chamber. Temperature is 45° F.—Food Ind, Feb, p84

Keeps Flyash off Chimney

Flyash accumulation on top of large power-plant chimneys can be avoided by locating an aspirating venturi nozzle in each chimney. At the Ohio River station of Southern Indiana Gas & Electric Co., a 14-ft. stainless-steel nozzle is installed in the top of the 250-ft. high, 16½-ft. dia. chimney.

Inside diameter of the nozzle at the outlet is 8 ft. 4 in. The nozzle entrance is belled out to the chimney diameter. This venturi design increases exit velocity of the gases.

At the same time, fresh air is drawn in through 28 openings, each 1 x 4 ft., cored through the chimney just above the base of the nozzle. The air moving upward between nozzle and chimney prevents settling of flyash on the chimney top.—Elec World, Feb 12, p136

New Rubber Belt Has Teeth

Split-second precision timing at speeds up to 16,000 fps. is achieved with a new rubber and steel or fabric belt with teeth. The belt, made by U. S. Rubber Co., looks like a flat belt except that it has regularly spaced rubber teeth across its inside surface. These teeth run in corresponding grooves in pulleys.

The belt does not slip or stretch and can operate on fixed centers without take-up adjustments. It has high efficiency with low bearing pressure. It requires no lubrication.

Successful applications include high-speed pumps, machine tools, business machines, Sonar equipment, and commercial sewing machines. Operating speeds can be increased with this belt by as much as 25%.—Steel, Jan 29, p71

Cadmium-Tin Alloy Plating Stops Engine-Part Corrosion

Corrosion is a serious problem in the manufacture and operation of aircraft engines. An investigation by Wright Aeronautical Corp. led to the development of a cadmium-tin alloy plating of high corrosion resistance.

The deposit is made from a fluoborate solution and contains about 75% cadmium and 25% tin. Best anode corrosion and adequate maintenance of metal content in bath are obtained by using individual anodes of cadmium and tin with a surface ratio of 1:3. Anodes are bagged to prevent bath contamination from a smut that forms on bare anode surfaces.

The bath is strongly acid with a pH of 2.5-3, so plating tanks are lined with glass or rubber. Parts and racks are masked with acid-resistant materials. If pH drops much below 2.5, the corrosion resistance of the coating is lowered.

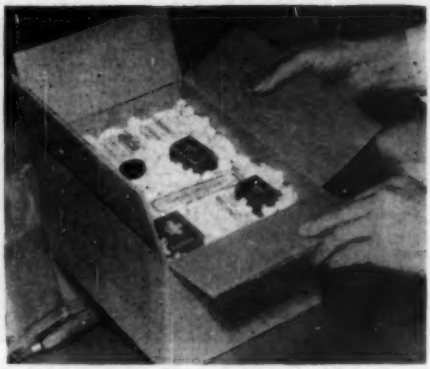
Plating rate of the bath is high because of the high cathode efficiency of the bath. For long-time operation of the bath, occasional filtering is needed for clarification.—Iron Age, Jan 18, p59

Holes Molded Accurately

A new IBM accounting machine required four control panels, each having 1,280 holes. The high material and drilling cost required that the panels be produced from molded phenolic.

Main problems in designing the mold were (1) control of molding shrinkage within ±0.007 in. in a maximum of 5 in.; (2) control of flatness; and (3) control of flash in holes so that finishing costs would not be excessive.

Northern Industrial Chemical Corp. designed the mold as a stripper plate mold with butt-type pins. Mold plates were jig bored. Air-hardening steel was selected for the plates.—Mod Plastics, Feb, p66



POPCORN PACKAGING

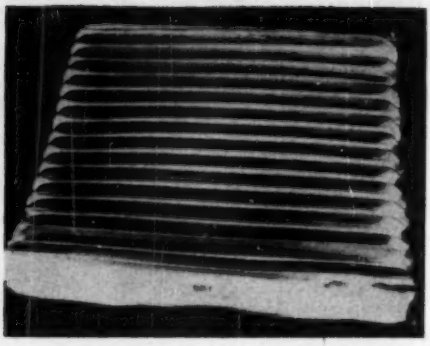
Plain old-fashioned popcorn makes a soft bed for these fragile items—in fact, not one bottle broke in a 60-ft. fall. Winthrop-Stearns Inc. dreamed up this idea, is now shipping bottles of pills bedded in popcorn, and expects soon to ship liquids. Other advantages: can be fed into shipping container mechanically and is cheap and readily available.—Chem Ind Week, Jan 20, p41

Signs of Uneasy Times

• Thickness of chromium plating on certain automobile parts has been reduced for 1951 as result of shortages. One company is using only one-fifth the normal thickness. Trim and many zinc die castings will probably disappear from automobiles this year.—Am Mach, Dec 25, p69

• A return to the electrostatic gun, much longer picture tubes, and deeper cabinets may face the television industry. Reason is that modern tubes use Alnico in focusing and centering magnets. But Alnico is 25% cobalt—a critically short item.—Electronics, Jan, p65

• Expansion of India's plastics industry is being hampered by short supply of polystyrene molding powder, which is imported from the U.S. and Canada. One ingredient of the powder, styrene monomer, is being diverted to American synthetic-rubber plants.—Prod Eng, Jan, p156



PANEL INTEGRALLY STIFFENED

Possible lower production costs and increased structural efficiency are causing aircraft manufacturers to investigate integrally stiffened panels for replacing usual built-up structures. One production method is forging. Proof that press forging is practical is shown by this forged panel made by Lockheed Aircraft Corp. and Wyman-Gordon Co. Panel is 25 in. square and has 1-in. stiffeners spaced at 1½ in. Larger surface panels also are practical.—Iron Age, Feb 1, p99

Fillet and Corner Radii Important in Die Design

Designers of forging dies for aluminum must pay particular attention to metal flow and specify generous fillet and corner radii.

Liberal fillets allow the forging stock to follow die contour. If a fillet is not large enough, the sharp corner on the die may cause a momentary void to form beyond the bend in the flow path. When the die is filled, the void is folded shut but leaves a flow in the forging. Such flaws are called cold shuts.

Adequate fillets also minimize uneven shrinkage as the metal cools after forging and later reduce distortion during quenching after heat treatment. Constant fillets lower diemaking costs as no time is wasted on blending in different radii.

Minimum edge radii are selected on the basis of ease of filling die cavity and reasonable die life. Forcing the metal into a sharp fillet on a forging may require excessive forging pressure. This can cause checking in the die after a short time. Therefore, full radii at edges of ribs and well rounded corners on other sections are essential to forging economy.—Mach, Feb 10, p185

Electrical-Image Camera

New type camera uses invisible electrical images and can make on-the-spot pictures even in active atomic radiation areas without being fogged. It produces a 4 x 5-in. picture in 2 min. that can be printed on paper, wood, cloth, glass, plastics, or ceramic materials.

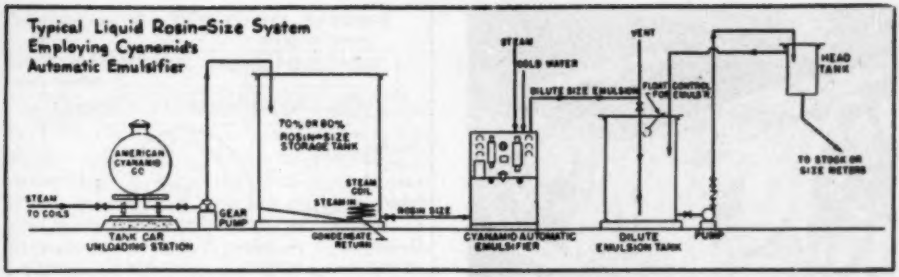
The camera utilizes the newly discovered electrostatic, electrophotographic process in which light is recorded on selenium-coated metal plate sensitized by an electrical charge. Electricity leaks off where light hits, leaving an invisible electrical image.

Finely ground charcoal is blown across the plate. The dust sticks wherever there is electrical charge. The powdered image is then transformed to the print material, which is coated with an adhesive layer such as rubber cement. The print is then protected by a transparent plastic film.

Development of the camera was a joint project of U. S. Army Signal Corps., Haloid Co., and Battalle Memorial Institute.—Prod Eng, Feb, p153

New Finish Saves Zinc

More plating with less zinc is claimed for Allied Research Products, Inc.'s new Iridite treatment for bright finishing of zinc plate in automatic machinery. Protective chromate film can be produced on zinc-plated coatings of less than 0.0001-in. thickness. Coating is flexible and can be applied in an immersion of 20 sec. to 1 min. No bleaching operation is required.—Iron Age, Jan 4, p386



***FLOW CHART** of rosin-size system with the new continuous size emulsifier shows how size is processed from tank car, through emulsification and dilution, to storage or size system*

Continuous Size Emulsifier

New automatic continuous emulsifier gives close control over solids content, reduces labor cost, and does not require large storage tanks

FROM 350 TO 1,650 LB. per hr. of 70-80% rosin size can be handled by American Cyanamid Co.'s new automatic continuous size emulsifier. The unit is designed to eliminate many of the undesirable features of the commonly used batch emulsification process; its advantages include:

- Close control of size-solids concentration.
- Excellent emulsion stability.
- Lower labor costs for emulsifying size than with the batch process. This cost varies with the mill's size requirements. The new unit may save part or full time of one or more operators per day.
- Elimination of need for several large dilute emulsion storage tanks.
- Less floor space needed than with the batch process.

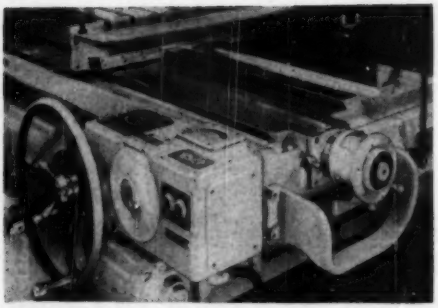
The new emulsifier is a compact, preassembled unit with a hot-water system, hot-water circulating pump, rosin-size heater, steam and cold-water pressure regulating valves, and a cold-water booster pump. When the unit is installed, it needs only steam, cold water, power, and necessary connections.

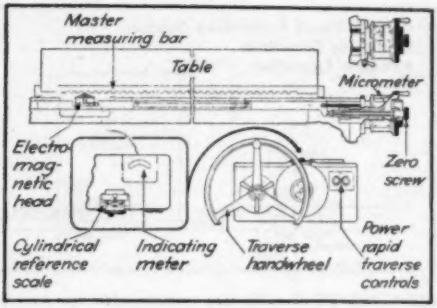
Emulsification is started by mixing hot water and concentrated size in a venturi-type mixer. The mixture flows through an emulsifying valve, which converts it to a primary emulsion. Further dilution with water gives the desired concentration. The size flows through a back-pressure valve either to storage or to the stock system.

The emulsifier is electrically interlocked and is automatically started and stopped by a float switch in the dilute-size storage tank. This switch actuates the size pump, which controls the solenoid pilot valves that open or close the stop valves for hot and cold water.

Flow rates are indicated by rotameters in hot- and cold-water lines and by a speed indicator on the gear pump for the thick size. Safety interlocks prevent the unit's being started or, if it is operating, automatically shut it down should there be any integral part of the system not working properly.

The size emulsifier is about 5 ft. wide, 4 ft. deep, and 6 ft. high. It can deliver uniform size emulsions at concentrations as low as 1½% solids and control the dilute size solutions to within ±0.1% of the desired solids content.—Paper Ind, Jan, p1069





JIG BORER HAS ELECTROMAGNETIC MEASURING SYSTEM

Model 4E Pratt and Whitney jig borer obtains 1-in. spacing from master measuring bars by electrical means. Each master bar has rectangular projections with 1-in. distance between their magnetic centers. One bar is lengthwise under table, and another is crosswise under carriage. Beneath each bar is an electromagnetic head, which detects exact magnetic center of each projection, as bar passes over, and then registers zero reading on meter. To locate hole, operator sets micrometer for inch fraction, operates power rapid traverse until reference scale reads approximate setting, and makes final adjustment by zero screw to bring meter reading to zero.—Am Mach, Feb 5, p178

Automatic Dispatching for Pneumatic Message Tube

Bridgeport Brass Co. is mechanizing its interoffice communications. The company's plant is installing an automatic pneumatic-tube system designed and built by Mix & Genest, German subsidiary of International Telephone & Telegraph Corp.

The system does away with the central dispatcher who ordinarily picks up incoming carriers and shunts them into another tube so they will go to the designated station.

IT&T's setup works like a telephone switchboard. Each carrier has two contact rings at one end with numbers from zero to nine stamped on. The sender dials the station he wants by turning the rings—to station 15, for instance—and puts the carrier in the pneumatic tube. Electronic "fingers" near the tube entrance pick up the number, flash it to the central switchboard. The switchboard, in turn, sends the signal down the line so that all the tiny doors for station 15 open when the carrier is sucked through.

If the sender accidently dials a nonexistent station, the switchboard automatically shoots the carrier to a reject tube.—Business Wk, Feb 3, p67

Welder Ignitrons Share Load

Ignitron tubes in an electronic welding control may be easily overloaded when the welder is used for a heavier weld or a longer time than intended. But this condition can be avoided by flip-flop control.

Separate equipment can be added to two ignitron contactors and a single heat control to fire the tubes of each contactor in turn for about 2 sec. each. Thus the two pair of tubes can be made to share the load by dividing the weld time between them.

The flip-flop thyratron circuit, by means of two relays, connects the heat control, first to one ignitor circuit and then to the second to fire the tubes in turn. Current flows to the welder without interruption.—Electronics, Feb, p71

Series-Arc Welding Offers Low Dilution in Cladding

Conventional submerged-arc welding can be made to produce shallow penetration of the weld bead, which is desirable in surfacing or cladding, by use of low travel speeds, low welding currents, high arc voltages. But dilution values are 20% or more; that is, 20% of fused metal consists of base plate and 80% of deposited metal.

A new method, developed by Union Carbide & Carbon Corp., reduces dilution to 1.5–10%. Welding current is made completely independent of the base-plate material by employing two or possibly more converging welding rods connected electrically in series so current flows from one to the other.

The work is insulated from the power source. So the current, instead of passing through the work, flows from one rod through the welding zone and back through the other rod to the power source.

In this method, called series-arc welding, the arc spreads out. Positioning the rods in a plane across the direction of travel produces a wide, thin weld deposit. Arranging more than two rods in an interlocking pattern permits even wider beads.

Each rod is independently fed by its own motor and voltage control system. Any of the commonly used submerged-arc welding heads can be adapted to this welding method.—Weld Eng, Jan, p38

Fire Safety Aids Developed

Two new aircraft fire safety aids have been brought out by the U. S. Civil Aeronautics Administration.

One of the developments is a flammability reference scale. It will help in making less flammable hydraulic fluids and lube oils. Function of the scale is to set up yardstick ratings to show what percentage of a nonflammable reference fluid (hexachlorobutadiene) combined with the test fluid minimizes the latter's flaming characteristics. The test is preformed by directing a mixture of the two fluids through an oxyacetylene flame.

Thus, a fluid that requires no hexachlorobutadiene is considered nonflammable and is given a zero rating. Increased ratings would indicate increasing flammability.

A new breakaway self-sealing coupling for fuel lines is intended to disengage automatically with a 7½-lb. pull at any angle up to 55°, sealing off the ends to contain the fuel. Recoupling is accomplished by pushing the ends together.—Aviation Wk, Jan 29, p45

How to Design BeCu Parts for Investment Casting

Wide range of properties and the excellent casting characteristics available in beryllium copper investment castings are increasing their use. Typical parts include cams, ratchets, gears, turbine blades, wave-guide plumbing, numbering wheels, and numerous others. Observance of following design rules will promote their economical production.

1. Keep tolerances as liberal as possible. Tolerances can be held to 0.002 in. per in. and on small dimensions to 0.001 in. per in.
2. Make minimum wall thicknesses 0.050 in. over large sections and 0.030 in. for small areas with taper.
3. Use fillets of at least $\frac{1}{32}$-in. radius wherever possible.
4. Specify ribs or crowns for large flat areas.
5. Allow ¼–½° for draft. This is not always necessary.
6. Keep hole minimum to 0.020 in. in dia. Blind holes can be cast.
7. Do not try to cast slots to width tolerances of less than 0.001 in. per in.
8. Chase threads after casting.
9. Allow $\frac{1}{16}$ in. per ft. for shrinkage.—Prod Eng, Feb, p114

Crane-Mounted Lift Doubles Available Storage Area

By moving lift trucks out of storage aisles, the Chicago Tramrail Co. can double available storage area. The method is called Stak-Rak—a storage system based on a crane-mounted electric lift and a network of self-standing rack columns.

Stak-Rak is designed as a one-man operation to transfer material in and out of storage. The lift attachment is mounted on a trolley that runs along an overhead crane. From the time material is picked up by Stak-Rak until it is deposited on the racks, one man, walking the load with a pushbutton pendant control, regulates all travel—the vertical rise of the lift, trolley travel along the crane, crane movement down the aisle, and rotation of the lift to either side.

The flexibility of travel is the factor that fully utilizes storage space. Aisle space is said to be one-half of that required by ordinary fork trucks. Aisle requirements for loads up to 2,000-lb. capacity are the actual physical dimensions of the unit handled, plus 8 in. for the column and necessary running clearance. Stak-Rak will stack to a height of 20 ft. Attachments permit Stak-Rak to handle palletized loads as well as skid boxes.—Factory, Feb, p132

Heard Around Detroit

▶ An automobile manufacturer has cut radiator-core weight from 46 to 24 lb. by reducing thickness of cooling fins and tubes. Fins are down to 0.003 in. from 0.006 in., and walls to 0.005 in. except where strength requires original 0.009 in. Assembly is more difficult, but copper is saved.

▶ New Chrysler bodies have spring-counterbalanced trunk lids. Springs are put in place before painting and oven-baking operations. Oven temperature softened the springs, so springs now have extra strength and come out of ovens with proper stiffness.—Am Mach, Jan 22, p321

▶ The first quarter of this year will see produced about 1¾-million cars and trucks if present schedules are met. But aluminum and copper conservation orders will be felt.—Am Mach, Feb 5, p109

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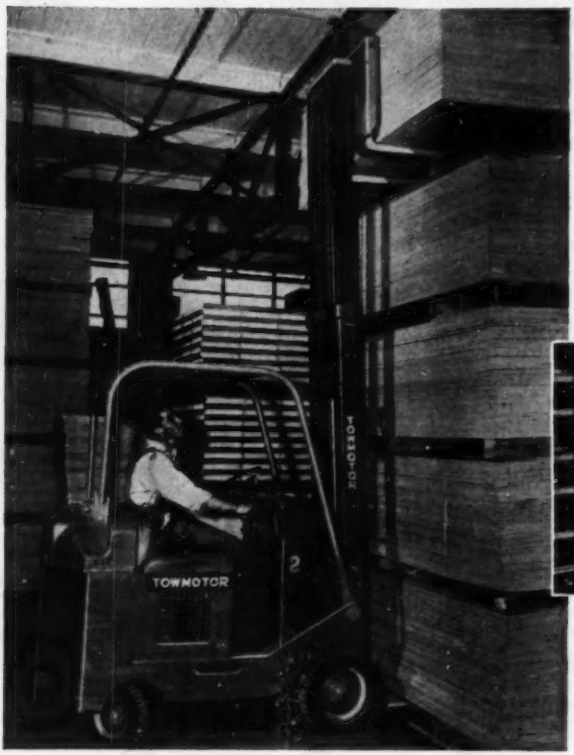

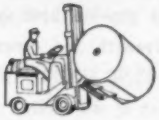

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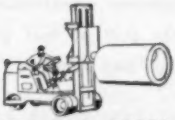

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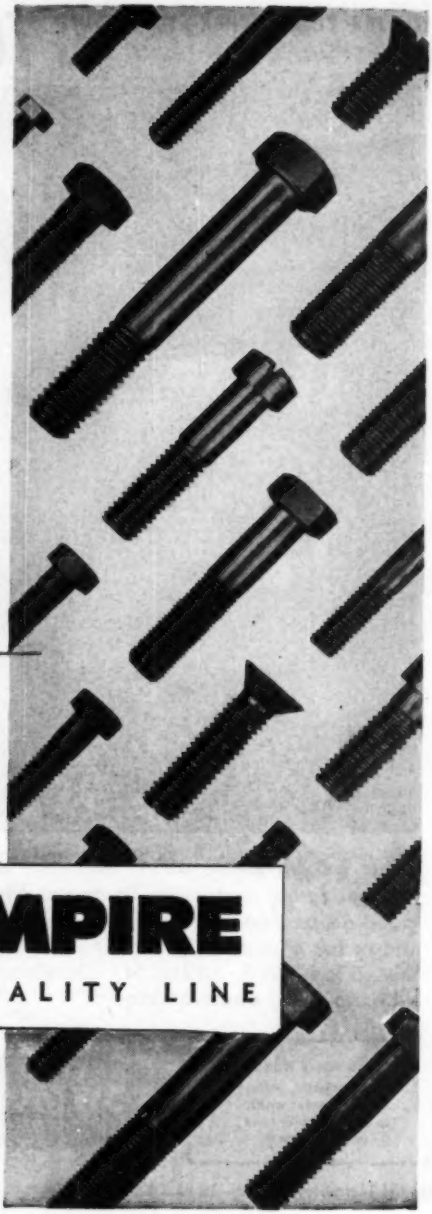

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Production Ideas

from Manufacturers' Catalogs

4-1 For Tanning Leather—American Cyanamid Co. 16p. Bulletin 574-11/50-3M-BP describes application of naphthalene type syntans and Tanak synthetic tanning agents.

4-2 Office Management — Clary Multiplier Corp. 24p. "Time, People, and Equipment" tells how to organize and equip an office staff for effective operation.

4-3 Materials Handling—Thew Shovel Co. 20p. "Lorains in Industry" shows industrial cranes handling many types of material in different industries.

4-4 Steel Tubing—Babcock & Wilcox Tube Co. 20p. Bulletin TB-335 gives terminology of steel tubing. Data card 136 shows compositions of alloy steel tubing.

4-5 Processing Equipment—Syntron Co. 44p. Catalog 512 covers company's line of vibrating equipment, hammers, rock drills, rectifiers, and other varied items.

4-6 Quenching Oils—Standard Oil Co. (N. J.) 12p. Lubetext D239-J3 is an excellent discussion on quenching and tempering oils and their use and care.

4-7 Flame Hardening — Cincinnati Milling Machine Co. 20p. Catalog M-1724 covers No. 2 Flamatic hardening machine and its many uses.

4-8 Modern pH Control—W. A. Taylor & Co. 96p. Book is a complete technical discussion on pH and chlorine control and equipment needed.

4-9 Modern Lighting — Sylvania Electric Products, Inc. 24p. Booklet FL-408 tells how to use modern lamps to get the most from your lighting expense.

4-10 Remote-control Wiring System—International General Electric Co. 34p. Manual gives complete information on layout and installation of remote-control wiring system with master selector switch.

4-11 Curtain Wall Construction—Allegheny Ludlum Steel Corp. 24p. Booklet presents proposed methods of curtain wall construction with stainless-steel sheathing backed with insulating material for multi-story buildings.

4-12 Overhead Crane—Whiting Corp. 20p. Catalog M-20 describes light crane and monorail system for handling loads of 250-20,000 lb. Applications are illustrated.

4-13 Preserves Wood—Dow Chemical Co. 32p. Two bulletins—DC12-K-649 and DC 18-N-350—tell how to preserve wood with pentachlorophenol solutions.

4-14 Motors and Generators—Westinghouse Electric International Co. 19p. Life-Line type SK d-c. motors and generators for many different applications are covered in bulletin B-4595.

4-15 Banbury Mixers — Farrel-Birmingham Co., Inc. 32p. Bulletin 189 describes mixers for rubber, asphalt, linoleum, plastics, other materials.

4-16 Mobile Crane—Bay City Shovels, Inc. 24p. "Bay City CraneMobile" pictures the 20- and 25-ton cranes in many lifting and long-boom jobs.

4-17 Gages Water Level—Bristol Co. 24p. Catalog L700 covers instruments for measuring and recording water depth in tanks, reservoirs, rivers, other locations.

4-18 Enclosed Motors—Fairbanks, Morse & Co. 4p. Bulletin 1215 covers totally enclosed, nonventilated motors for use under dusty or corrosive conditions.

4-19 Construction Equipment—Hyster Co. 22p. Form 1170 describes use of Hystaway excavator-crane. Form 1175 introduces grid roller for salvaging and repair of bituminous pavement.

4-20 Aluminized Steel—Armco Steel Corp. 24p. Booklet describes steel's aluminum surface, properties, and applications.

4-21 Controls Feedwater—Bailey Meter Co. 16p. How to control boiler feedwater is covered in bulletin 105-C. Installations are shown.

4-22 Mechanical Packings — Flexrock Co. 32p. Catalog 30M-11-50 covers the many types of mechanical packings needed in modern processing.

4-23 Dryers, Kilns, Coolers—Hardinge Co., Inc. 32p. Ruggles-Coles rotary dryers, kilns, and coolers for processing bulk material are covered in bulletin 16-D.

Production Ideas (Cont.)

4-24 Farm Equipment—New Holland Machine Co. 24p. Two bulletins describe use of forage harvester and model 77 Automatic hay baler.

4-25 Tests Flow Rate—Fischer & Porter Co. 20p. Technical bulletin A-9C-4 contains comprehensive data on new developments on fluid flow rate testing.

4-26 Diesel Engines—Murphy Diesel Co. 28p. Form 110 covers construction and specifications of 4 and 6 cyl. engines from 90 to 220 hp. and of generator sets.

4-27 Synthetic Detergents—Diamond Alkali Co. 8p. Bulletin 03-A-DI-AQUA discusses alkyl aryl sulfonates and their use in compounding synthetic detergents for household and industrial cleaners.

4-28 Crane-excavators — American Steel Dredge Co., Inc. 14p. Form 417 WC-20M-1-51 illustrates Wayne Crane ½-yd. crane-excavators for construction jobs.

4-29 Gaskets—U. S. Gasket Co. 48p. General catalog shows complete line of metal, metal-asbestos, and cut gaskets plus Teflon gaskets, packings, adaptors.

4-30 Link V-belts—Manheim Mfg. & Belting Co. 8p. Form 30M-8-47 describes link V-belt adjustable to any length and adaptable to any drive.

4-31 Silica Gel—Davison Chemical Corp. 8p. Catalog 10-50-10M discusses dehydrated packaging with silica gel to avoid moisture damage.

4-32 Floor Maintenance—Hillyard Chemical Co. 48p. "Modern Maintenance" describes cleaners, waxes, and other materials and equipment for good floor maintenance.

4-33 How to Select Pumps—Allis-Chalmers Mfg. Co. 16p. Form 52B6059G is a handy guide to selection of centrifugal pumps for wide variety of industries.

4-34 Corrosion-proof Linings—Atlas Mineral Products Co. Data sheet 4-1 gives in condensed form information on corrosion-proof linings for concrete or steel.

4-35 Universal Grinders—Landis Tool Co. 24p. Revised catalog 1-49 describes and illustrates 10-in. and 12-in. hydraulic universal cylindrical grinders.

4-36 Phenol Resin—Hercules Powder Co. 12p. Bulletin 4060 describes use of Vinsol resin in making Buna N cements and adhesives.

4-37 Export Directory—Waukesha Motor Co. 12p. Directory 21 lists overseas representatives and dealers of its engines.

More Aluminum Handbooks—Reynolds Metals Co. In Nov. '50 issue, we announced three Reynolds handbooks. The company now is offering two more—the 194-page "The Aluminum Data Book" and the 130-page "Aluminum Structural Design." The data book covers all types of aluminum alloys, has 117 tables on properties and much information on processing. The design book gives information and data that the engineer needs to design aluminum structures. For your copies, write on your company letterhead to Reynolds Metals Co., Export Division, 19 East 47th St., New York 17, N. Y. Do not write to us or ask for these books on coupon below.

COPIES of these manufacturers' catalogs will be sent free to subscribers. Fill in squares with catalog numbers desired and mail to the Editor, McGraw-Hill Digest, 330 W. 42nd St., New York 18, N. Y., U. S. A.

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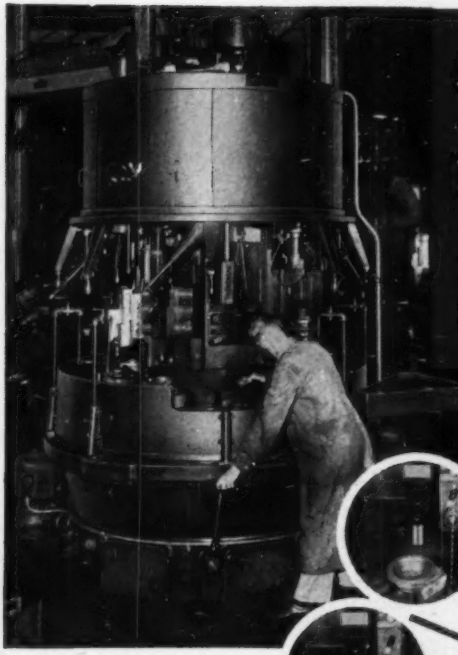

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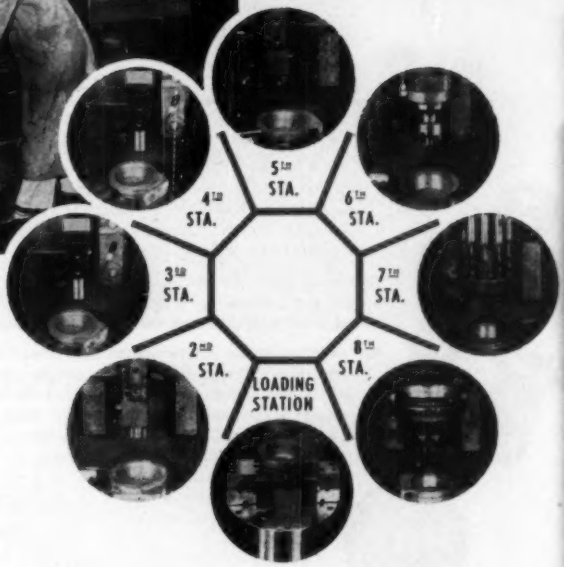

1st Station—:
Loading

2nd Station—:
Rough Bore—Three Diameters

3rd Station—:
Rough Face—Three Surfaces

4th Station—:
Finish Face—Three Surfaces

5th Station—:
Finish Bore—Three Diameters and Chamfer

6th Station—:
Precision Bore—Two Diameters

7th Station—:
Multiple Drill—Ten Holes

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Multiple Tap—Ten Holes

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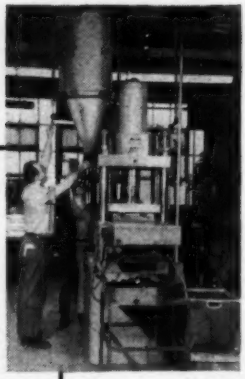
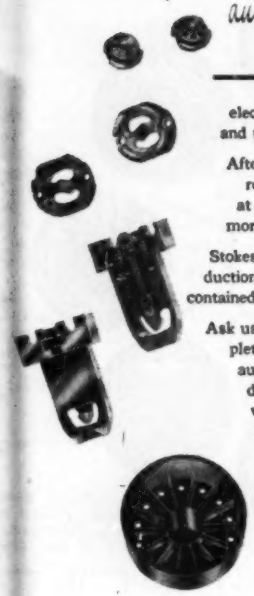


Picture of Stokes Automatic Molding press in Sylvania plant shows full drum of molding powder mounted over hopper

You can mold plastic parts like these automatically!



These plastic parts are made on Stokes fully automatic molding presses at Sylvania Electric Products, Inc., U.S.A. All are used in electrical and electronics equipment. They are identically accurate, and uniform in finish and density.

After the mold is run in and the machine adjusted the only attention required is the filling of the hopper and removal of finished parts at regular intervals. One unskilled operator can handle a dozen or more automatic presses.

Stokes Automatic Presses assure perfect products, continuous production, and great savings in labor and materials. They are self-contained, require no preheater, and are easy to install and operate.

Ask us for assistance in selecting the right press from the complete line of Stokes molding presses; also for advice on auxiliary equipment, molding compounds and mold design. If convenient, send blueprints or parts so we can advise of their adaptability to automatic molding. Stokes Advisory Service, with nearly a half century of recorded experience, is available to you without obligation.

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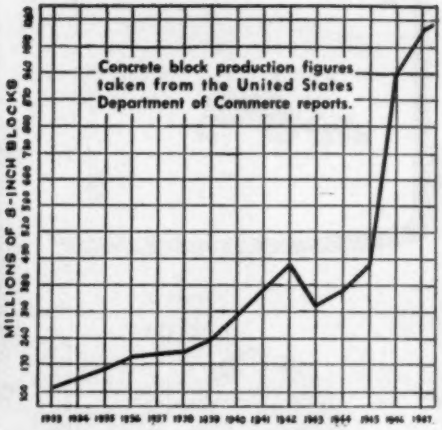
Concrete block production figures taken from the United States Department of Commerce reports.
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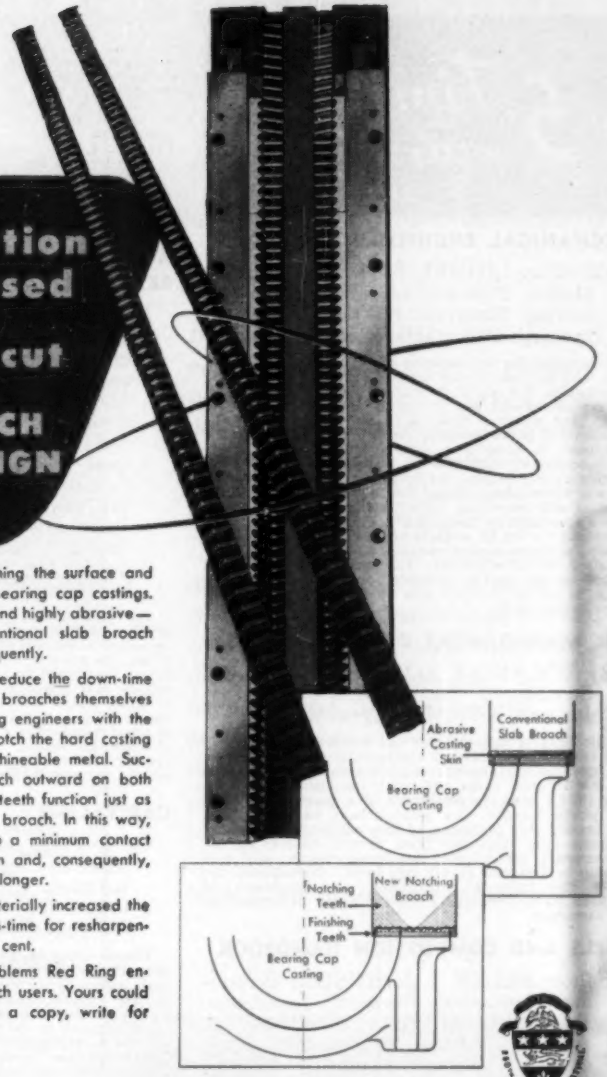

The job in question is broaching the surface and edges of automotive main bearing cap castings. The surface skin is very hard and highly abrasive—so much so that the conventional slab broach requires sharpening very frequently.

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THE MANAGEMENT OF BANK FUNDS

By ROLAND I. ROBINSON, School of Commerce, Northwestern University. January, 1951. 416 pages, $5.50

This book brings together the scattered and largely oral traditions of modern commercial bank practices. The devastating experience of the Great Depression, the low interest rates and small loan demands of the arid 1930's, and the emergence of a great public debt and public interest rate policies have vastly changed the managerial problems of the commercial banking system. Very little has been written concerning the adjustments necessitated by these events, and this volume is designed to fill this need. Throughout the study the interests, aptitudes, and problems of bankers have been the author's guide in exposition and coverage.

FUELS AND COMBUSTION HANDBOOK

Editor, ALLEN J. JOHNSON, Consulting Mechanical Engineer, Lansdowne, Pa.; Associate Editor, GEORGE H. AUTH, Professor of Mechanical Engineering, Villanova College. January, 1951. 915 pages, $12.50

Factual data on the properties, characteristics, and uses of all solid, liquid, and gaseous fuels; the basic types of combustion of these fuels; and the operation and use of combustion equipment—all are contained in this practical handbook. It not only treats such pertinent factors as the determination of heat balances, smoke prevention, and draft requirements, but also discusses the factors involved in the selection and purchase of fuels, the preparation of fuels for utilization, fuel handling and storing, and the transfer and generation of heat. Separate chapters cover anthracite and bituminous coal, manufactured solid fuels, petroleum and petroleum derivatives, boilers and steam generators, furnace design, as well as methods of firing solid, liquid, and gaseous fuels, and miscellaneous sources of heat and power. Comparative tables showing advantages, disadvantages, features, performance data, and applications of optional equipment are of inestimable aid to fuel technicians, engineers, and operating men.

ADVERTISING PSYCHOLOGY AND RESEARCH: An Introductory Book

By DARRELL BLAINE LUCAS, Chairman, Department of Marketing, School of Commerce, Accounts, and Finance, and Professor of Marketing, the Schools of Business, New York University; Research Consultant, Batten, Barton, Durstine, and Osborn, Inc.; and Technical Director, Advertising Research Foundation, Inc.; and STEUART HENDERSON BRITT, Director of Personnel and former Manager of the Research and Merchandising Departments, McCann-Erickson, Inc. December, 1950. 765 pages, $6.50

This excellent new book offers an adroit combination of the psychological principles of advertising with extensive applications of practical research methods; it will be equally valuable to practitioners of advertising interested in psychology and research and to college and business students. Those materials are included which will be most useful in providing the reader with a sound understanding of the psychology of advertising. The aim is to develop a scientific point of view in dealing with all phases of advertising. Specific examples and illustrations are used throughout, and an unusually complete glossary is included.

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By DAVID McCORD WRIGHT, Professor of Commerce and Business Administration, University of Virginia. *Economics Handbook Series.* January, 1951. 246 pages, $3.25

While many books deal with capitalism as if it were the only economic system having problems, this book begins by showing the problems that must be met by *any* system, and then explains capitalism. This book examines the way in which capitalism achieves rapid increase in the output of economic goods and the manner in which democratic freedom has accomplished free enterprise; some of the failings of the system are then discussed and remedies suggested. The author devotes much time to analyzing the mechanism and problems of capitalism in terms of alternative "culture concepts," and the ideological basis of society, as well as to the careful dissection and comparison of Marxist and capitalist attitudes. The business cycle, monopoly, stabilization, union policy, and other important subjects are covered.

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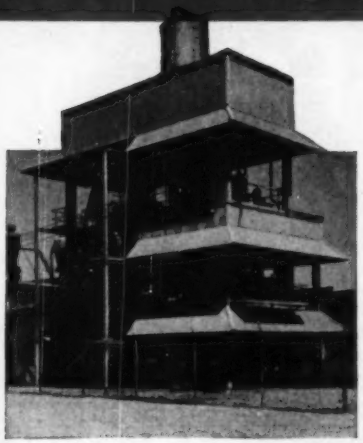

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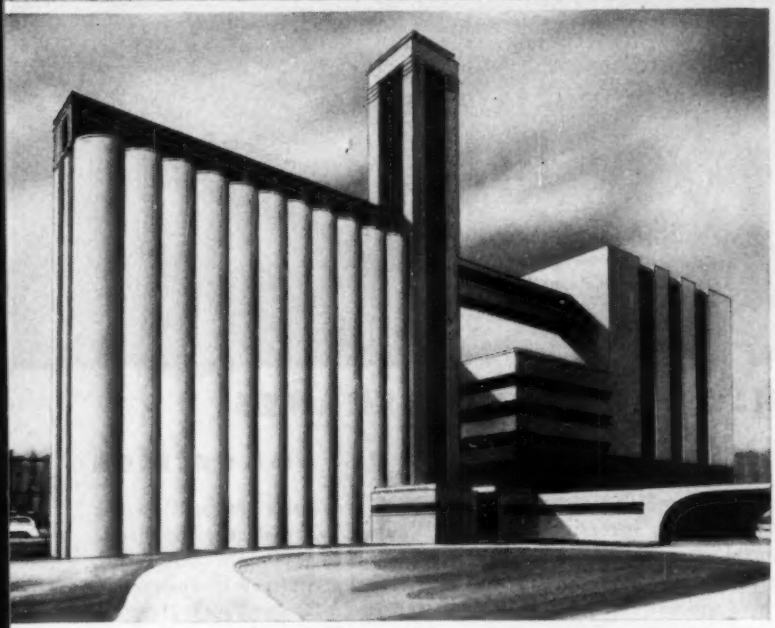

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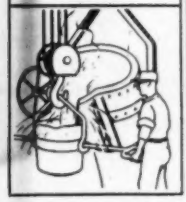	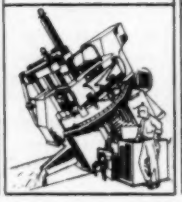		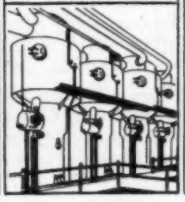	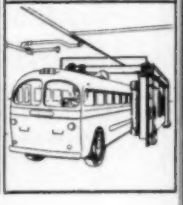

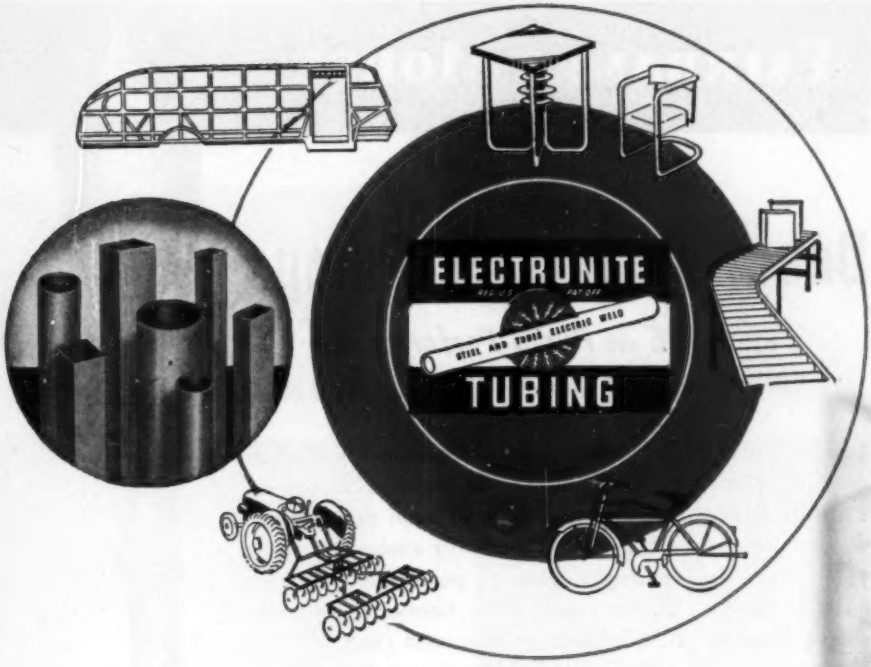

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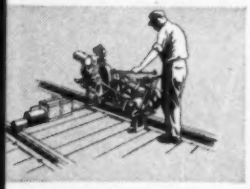

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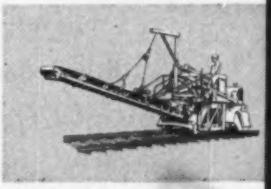

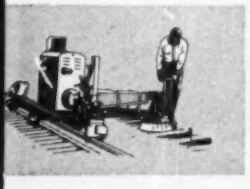

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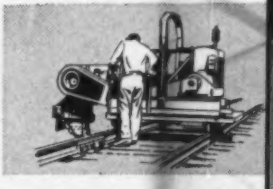

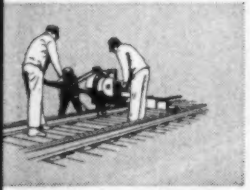

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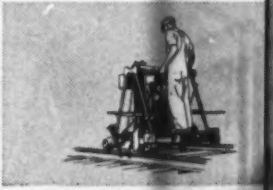

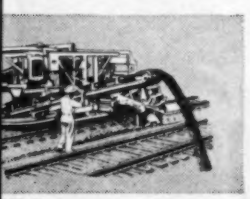

SCREENEX . . . Takes excavated fouled ballast fed by BALLASTEX, cleans material and returns it to track, intertrack, or shoulder.

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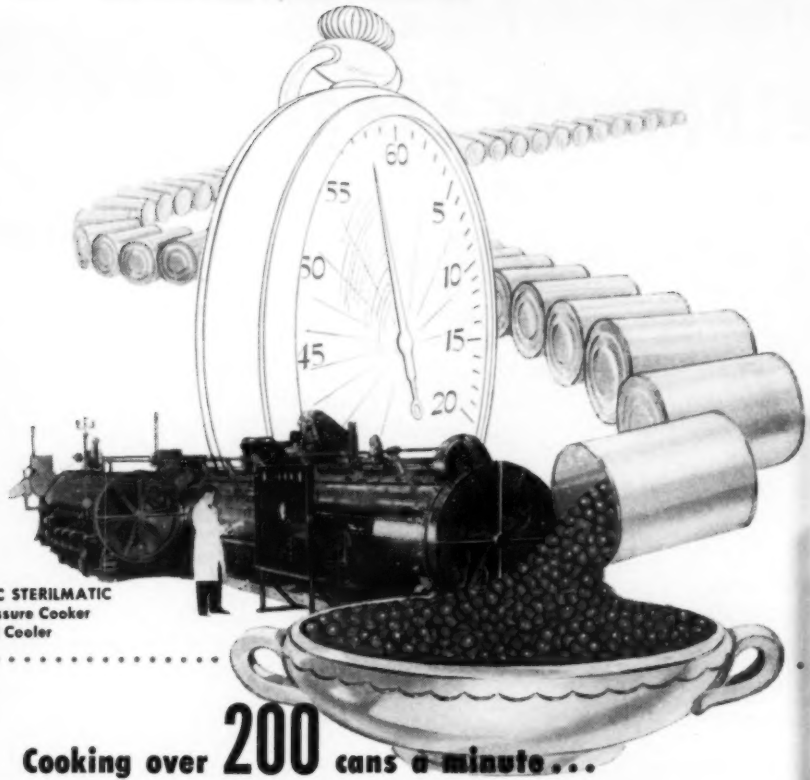

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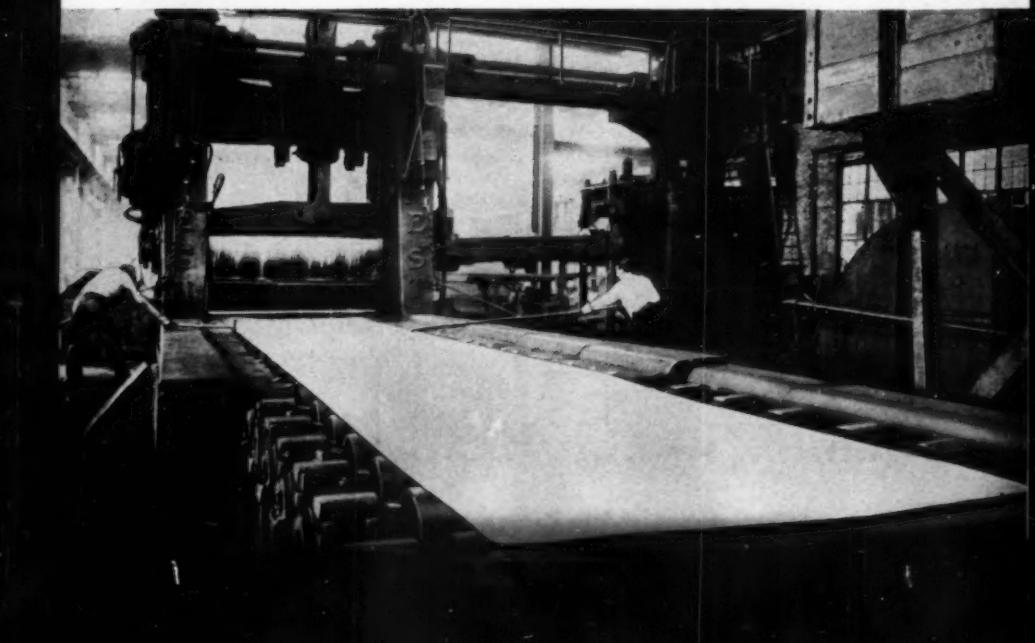
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